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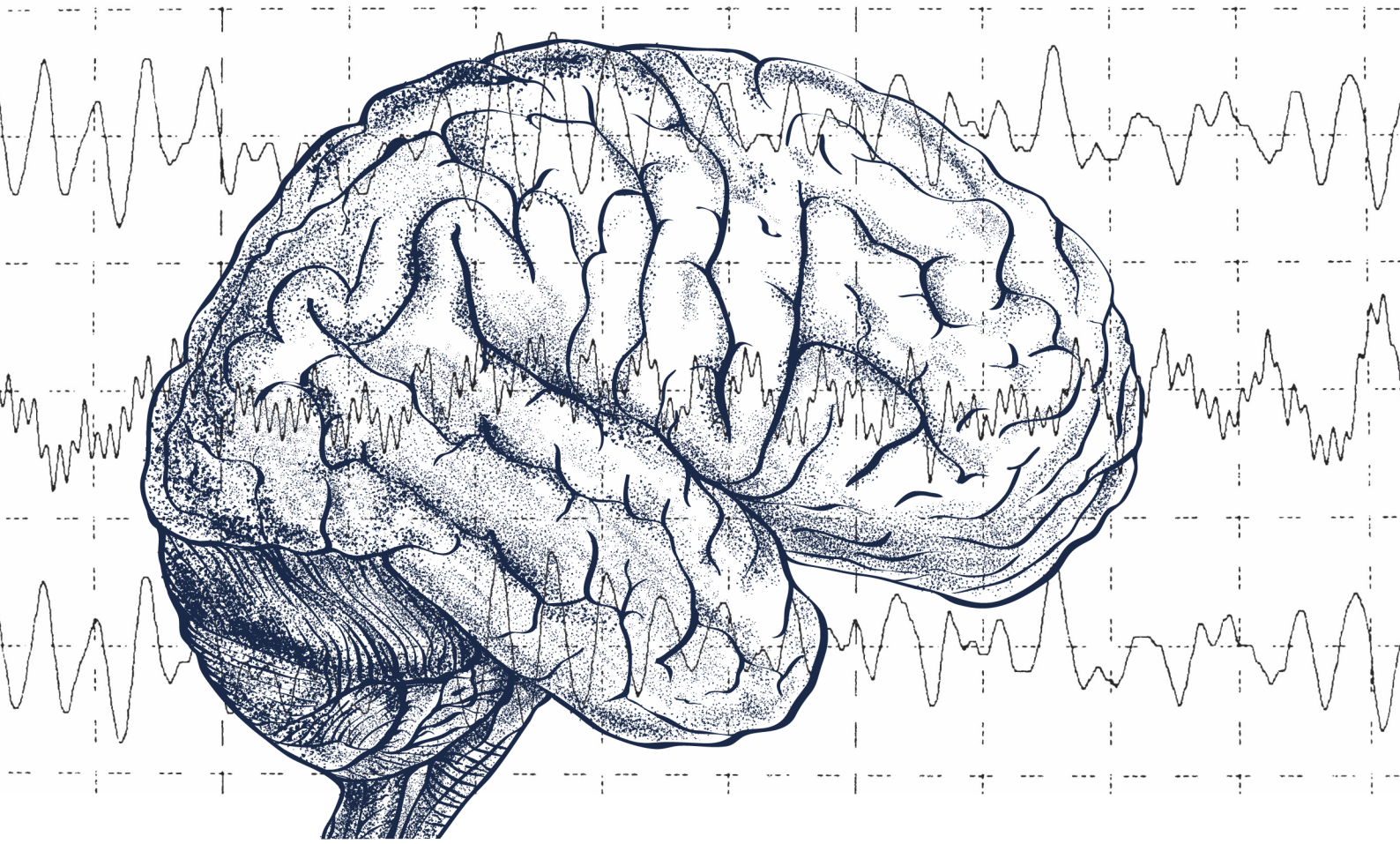

38th Annual Meeting of the Associated Professional Sleep Societies

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SLEEP

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Abstracts by Category

Welcome to your preview of SLEEP 2024, the 38th Annual Meeting of the Associated Professional Sleep Societies, which is scheduled to be held in Houston, Texas on June 1–5, 2024.

This abstract supplement unites the journal *SLEEP*, and the science of SLEEP 2024. All abstracts presented at SLEEP 2024 are included in this supplement. This year 1155 abstracts will be presented at the meeting. 186 will be presented in an oral presentation format, and the remainder will be presented in a poster format. Many authors of oral presentations will also be presenting their science in the poster hall, providing additional time to network with the authors of these important studies. In addition, this supplement contains case reports submitted by individuals in Sleep Medicine Fellowships and other training programs.

Abstracts in this supplement are divided between Basic and Translational Sleep Science, and Clinical Sleep Science and Practice, and then assigned to one of 27 subcategories. Each abstract has a unique four-digit number to facilitate identification and location both within this issue and at SLEEP 2024. The four-digit number in the abstract supplement matches the four-digit code published in the SLEEP 2024 Mobile App.

The SLEEP meeting fosters an environment in which members and attendees learn about the latest basic, translational, and clinical science and technologies, promoting the continued growth of the field through the dissemination of new knowledge. We look forward to seeing everyone and sharing in the success of this pivotal event and hope you consider joining the American Academy of Sleep Medicine and Sleep Research Society in Houston, Texas in June.

Allan I. Pack. MBChB, PhD
Editor-in-Chief

Abstract citation ID: zsae067.0001

0001

CIRCADIAN REST-ACTIVITY RHYTHM PATTERNS AND PHYSICAL PERFORMANCE IN COMMUNITY-DWELLING OLDER MEN

Yujia (Susanna) Qiao[1], Dorothy Chen[2], Jamie Zeitzer[3], Sonia Ancoli-Israel[4], Terri Blackwell[1], Patrick Bradshaw[5], Alexander Posner[5], Susan Redline[6], Gregory Tranah[1], Kristine Yaffe[7], Katie Stone[8]

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Introduction: Circadian rest-activity rhythms (RARs), a behavioral manifestation of circadian rhythms, reflect physical activity and sleep patterns over the 24-hour day. With aging, disrupted RARs may be associated with higher cardiometabolic risk, fall risk and cognitive decline. Physical performance also declines with advancing age, leading to disability and increased risk of mortality. However, the associations between RARs and physical performance are understudied.

Methods: In the Osteoporotic Fractures in Men (MrOS) study, 2,924 men (age=76.3+/-5.5 years, 90% white) completed sleep ancillary study (baseline), had valid wrist-worn actigraphy data (mean=5 days) and physical performance measures. Physical performance measures included: 6-meter gait speed, grip strength, and chair stand pace assessed at baseline and up to two follow-up visits over 3.4+/-3.1 years. Using a shape-naive technique, functional principal components analysis (fPCA), we examined baseline patterns of RARs over several days and evaluated cross-sectional and longitudinal associations of these patterns with each physical performance measure separately using mixed effect models. Models were adjusted for age, race, education, body mass index, smoking, alcohol use, caffeine consumption, multimorbidity, medication use and depressive symptomology.

Results: At baseline, gait speed was 1.14+/-0.23 m/s, grip strength was 40.8+/-8.4 kg, and chair stand pace was 4.4+/-1.7 stands/10 sec. Four fPCA components (explaining 88% variance) were identified with higher eigenvalues meaning: 1) high overall amplitude (50%); 2) later rise and bed times (23%); 3) longer, biphasic activity patterns (9%); and 4) evening peaks in activity (6%). Cross-sectionally, higher fPCA1 was associated with faster gait speed and chair stand pace ($p< 0.05$); higher fPCA3 was associated with slower gait speed, worse grip strength, and slower chair stand pace ($p< 0.05$). Longitudinally, higher fPCA1 was associated slower decline in gait speed and in chair stand pace ($p< 0.05$); higher fPCA2 was associated with accelerated decline in chair stand pace ($p< 0.05$); higher fPCA3 and fPCA4 were both associated with accelerated decline in gait speed ($p< 0.05$). No longitudinal association was found with grip strength.

Conclusion: Specific disruptions in RARs are associated with poor physical performance and its subsequent decline in older men. It suggests the contribution of circadian system in influencing age-related physical performance.

Support (if any): NIA R21AG051380 and R01AG034157

Abstract citation ID: zsae067.0002

0002

ASSOCIATIONS BETWEEN SLEEP AND REST-ACTIVITY RHYTHMS WITH DIET QUALITY IN THE MULTI-ETHNIC STUDY OF ATHEROSCLEROSIS

Kaitlin Potts[1], Chris Ho Ching Yeung[2], Danielle Wallace[1], Sina Kianersi[1], Alexis Wood[3], Hassan Dashti[4], Qian Xiao[2], Tianyi Huang[1], Susan Redline[5], Heming Wang[5]

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Introduction: Diet, sleep, and rest-activity rhythms (RAR) influence cardiometabolic health but the relationship among these behaviors is less clear. Evidence of associations between sleep and diet have focused on self-reported sleep duration and quality, and have rarely investigated sleep timing, regularity, and RAR metrics. This study assessed cross-sectional associations between sleep and RAR regularity and timing with overall diet quality.

Methods: Multi-ethnic Study of Atherosclerosis (MESA) participants who completed validated sleep and food frequency questionnaires and 7-day actigraphy monitoring (Actiwatch Spectrum) between 2010-2013 were eligible for study inclusion. Overall diet quality was measured with the Alternate Healthy Eating Index (AHEI) 2010 (range: 0-110, higher indicates healthier diet). Actigraphy records were processed using Actiware-Sleep (v5.59) software and manually annotated using a sleep diary. Sleep timing was measured with average sleep midpoint, and sleep regularity measures included within-individual standard deviation (SD) of daily sleep duration and onset. Parametric (extended cosine) and nonparametric 24-hour RAR measures were derived from 1-minute epoch-level activity counts. Associations between sleep and RAR metrics with AHEI were tested with multivariable linear regression adjusting for total energy intake, sociodemographic and lifestyle factors including smoking, total activity, and depressive symptoms.

Results: This study included 1828 participants (mean [SD]: age: 68.5 [9] years, AHEI: 59 [10.9]; 46% male). Later sleep midpoint and L5-time (start time of the 5 least active hours) were associated with lower AHEI (0.61% and 0.77% lower AHEI per SD later midpoint [$p=0.005$] and L5-time [$p=0.001$], respectively). Irregular sleep timing (sleep onset-SD >60 minutes [vs. less]) was associated with 1.1% lower AHEI ($p=0.014$). Rhythm robustness, measured by the pseudo-F (parametric RAR) and relative amplitude (RA, non-parametric RAR) was associated with higher AHEI (0.49% and 0.48% higher AHEI per SD increase in pseudo-F [$p=0.031$] and RA [$p=0.036$], respectively). The associations between later sleep midpoint and L5-time with lower AHEI were robust to false discovery rate (FDR)-corrected significance thresholds.

Conclusion: Actigraphy-based measures of later sleep timing, irregular sleep, and weakened rest-activity rhythms were associated with lower/worse diet quality in an older, multi-ethnic sample, suggesting their potential utility in multi-component lifestyle interventions.

Support (if any): NIH NHLIB T32HL007901, NHLBI HL56984, and NIA R01AG070867

Abstract citation ID: zsae067.0003

0003

NOCTURNAL WAKEFULNESS IS ASSOCIATED WITH ALTERED MACRONUTRIENT INTAKE IN A NATIONALLY REPRESENTATIVE SAMPLE

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[1] University of Arizona, [2] Columbia University Irving Medical Center

Introduction: The "Mind After Midnight" hypothesis suggests that being awake at night is associated with cognitive/affective dysregulation and impaired decision-making. Previous work identified risks associated with suicide. The present study examined whether nocturnal wakefulness is associated with aberrant food intake.
Methods: Data were extracted from the National Health and Nutrition Examination Survey (NHANES) 2015-2016 and 2017-2020 pre-pandemic waves (N=13,995). Multivariate linear regression estimated the relationship between hours of wakefulness from 11pm-5am (predictor) and multiple dietary outcomes. Models were unadjusted and adjusted for age, sex, race/ethnicity, employment status, education, and self-reported total sleep duration. In some cases, models were additionally adjusted for total caloric intake.
Results: There were significant differences in the sex, age, race/ethnicity, education, and total sleep duration of individuals who experienced more nocturnal wakefulness (all $p < 0.001$). Duration of nocturnal wakefulness was not associated with total caloric intake in unadjusted or adjusted models. Greater time spent awake during the night was associated with less protein intake (adjusted $\beta=0.96$, $p=0.004$), more sugar intake (unadjusted $\beta=2.9$, $p=0.012$; adjusted $\beta=2.6$, $p=0.004$) and less fiber intake (unadjusted $\beta=0.49$, $p=< 0.001$; adjusted $\beta=0.35$, $p=0.005$) after adjusting for total caloric intake. There was also a trend toward greater intake of saturated fats (adjusted $\beta=0.19$, $p=0.083$).
Conclusion: Our study shows that individuals with greater nocturnal wakefulness have higher intakes of nutrients that are frequently found in more highly processed foods, such as added sugar and saturated fats, and fewer nutrients found in healthier dietary options, such as fiber and protein. The dietary profile of individuals with higher nocturnal wakefulness may predispose them to chronic conditions. The propensity for unhealthy eating when awake during the biological night may be an important and underexplored public health concern.
Support (if any):

Abstract citation ID: zsae067.0004

0004

CIRCADIAN ALIGNMENT AND BODY COMPOSITION IN OVERWEIGHT/OBESE ADULTS

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[1] Oregon Health & Science University

Introduction: Misalignment between behaviors (i.e., eating/sleeping) and the circadian timing system promotes increased risk of diabetes and obesity. Though circadian disruption has been shown to be associated with higher body fat percentage (BF%) and abdominal fat distribution among healthy weight males, but not females, these relationships may be altered in individuals with higher body mass index (BMI) given the complex interaction between obesity and circadian metabolic mechanisms. We therefore tested the association between circadian alignment and body composition in individuals with overweight/obesity.
Methods: BF% and android-gynoid (AG) percent fat ratio was assessed using dual energy x-ray absorptiometry in 28 participants (15 female). Dim-light melatonin onset (DLMO; 3pg/ml threshold) was used as a marker of circadian phase, as determined from saliva samples across an ~8h evening in-laboratory stay in dim-light (< 5 lux). Circadian alignment was determined via phase angle of entrainment, defined as the time difference between DLMO and diary-determined sleep onset over 7-days. Differences between females and males were assessed using independent t-tests and the relationships between phase angle of entrainment and body composition metrics were assessed using Pearson correlation analyses.
Results: There were no differences between groups in age (mean(SD), females vs. males, respectively; 34.2(8.2) y vs. 37.2(8.3) y; $p=0.35$), BMI (34.9(5.9) kg/m2 vs. 31.0(6.5) kg/m2; $p=0.11$), DLMO timing (19:35(1:15) vs. 19:37(0:57); $p=0.95$), or phase angle of entrainment (2.9(1.7) h vs. 3.0(1.1) h; $p=0.77$). Females had higher BF% than males (45(6) % vs. 34(8) %; $p< 0.01$) and lower AG ratios than males (1.06(0.13) vs. 1.33(0.15); $p< 0.01$). Phase angle of entrainment [i.e., later sleep] was negatively correlated with AG ratio only in males ($r= -0.6$; $p=0.03$) while phase angle of entrainment had a negative correlation with BF% only in females ($r= -0.65$; $p=0.01$).
Conclusion: Alignment of the circadian system (i.e., smaller phase angle of entrainment) may be a contributing factor to poorer body composition and, particularly amongst males, metabolically unhealthy body fat distribution in individuals with overweight/obesity. The mechanistic role of circadian timing on cardiometabolic disease risk may be differentially affected by sex and obesity, which could have implications for targeted interventions to improve health outcomes.
Support (if any): NIH T32HL083808, K01HL146992, R35HL155681

Abstract citation ID: zsae067.0005

0005

TIME-RESTRICTED EATING IMPROVES INTERMITTENT HYPOXIA-INDUCED DYSGLYCEMIA

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Introduction: Obstructive sleep apnea (OSA) is associated with dysglycemia, insulin resistance, and type 2 diabetes. Continuous positive airway pressure has not been shown to improve metabolic outcomes in OSA. Intermittent hypoxia (IH) modeling OSA causes dysglycemia in rodent models. Time restricted eating (TRE), which limits daily caloric intake to a fixed window, improves metabolic profiles in mice and humans. We hypothesized that TRE would improve IH-induced dysglycemia.
Methods: C57BL/6J mice were fed a high-fat diet for four weeks, and then divided into four groups (n=16/group), with additional exposures lasting four weeks. Group 1 was exposed to room air (RA), with ad libitum access to HFD. Group 2 was exposed to RA, but on a TRE protocol, restricting HFD intake to 9h/d, from 9:00 PM to 6:00 AM. Group 3 was exposed to IH (FiO2 0.21 to 0.06 once/min for 12 hours during light phase, and FiO2

0.21 during dark phase), with ad libitum access to HFD. Group 4 was exposed to IH and TRE. Cages were changed each morning to minimize food hoarding. Glucose tolerance tests (GTT) were performed before and after the exposures, and dual energy x-ray absorptiometry (DEXA) was performed on a subset. Serum insulin was measured.
Results: Fasting glucose was reduced in IH-TRE (-25.4±5.6 mg/dL, p< 0.001) but not in other groups. GTT area under the curve was increased in RA-ad lib (3155±924 mg*min/dL, p=0.002) and IH-ad lib groups (5267±1161 mg*min/dL, p< 0.001), but not in TRE. Insulin was increased in RA-ad lib relative to other groups (p< 0.010 for all), implying insufficient insulin secretion, particularly in IH-ad lib. Body fat was reduced with both IH (p=0.028) and TRE (p< 0.001). Serum 1,5-anhydroglucitol, inversely related to pancreatic β-cell dysfunction, was increased in TRE (p=0.011).
Conclusion: In IH modeling OSA, TRE improves glucose homeostasis, via improved pancreatic insulin secretion. Intermittent fasting may be a viable therapeutic option in OSA.
Support (if any): This project was supported by NIH K08HL143140 and UCSD RS295R.

Abstract citation ID: zsae067.0006

0006
CIRCADIAN CYCLIC GENE EXPRESSION IN HUMAN AIRWAY EPITHELIAL CELLS IN ASTHMA AND VIRAL INFECTIONS

Weston Powell[1], Lindsay Clark[2], Maria White[1], Lucille Rich[1], Camille Gates[1], Elizabeth Vanderwall[1], Jason Debley[1]
[1] Seattle Children's Research Institute, Center for Respiratory Biology and Therapeutics, [2] Seattle Children's Research Institute

Introduction: Cellular circadian rhythms regulate gene expression and innate immune pathways related to airway diseases in animal models of disease. However, circadian regulation of gene expression remains uninvestigated in human airway epithelial cells. Primary human airway epithelial cells can be grown at an air-liquid interface as an ex vivo organotypic model to characterize molecular circadian rhythms in the human airway. Using cells from healthy and donors with disease, we hypothesized that circadian cyclic gene expression would be altered in asthma and would display altered viral responses.
Methods: Cells were synchronized with temperature cycled incubators and RNA isolated every 4 hours over a 48 hour period for RNA-sequencing from primary human airway epithelial cells from healthy and asthmatic children. CompareRhythms in R was used to identify differential rhythmicity using the cosinor method. EnrichR pathway analysis for Reactome, Panther, GO molecular functions, and GO biological processes was used to identify relevant biological pathways with altered circadian rhythmic expression. Human rhinovirus 16 was applied to the apical surface at a multiplicity of infection of 0.5 and RNA isolated 96 hours later for genome copy number assessment with PCR.
Results: Circadain clock genes were rhythmic in airway epithelial cells from health and donors with asthma with preserved phase relationships indicating an intact core circadian clock. Analysis of circadian cyclic gene expression identified 4% of genes with circadian cyclic gene expression following temperature synchronization. Approximately 100 genes demonstrated altered circadian rhythmicity in airway epithelial cells from donors with asthma. Circadian rhythm and nuclear receptors had common rhythmicity in healthy and asthma. IL-17 signalling, cytokine receptor, and neutrophil chemotaxis pathways had altered circadian rhythmicity in asthma. Infection at time zero (end of temperature cycling) was associated with a two-fold lower viral replication than infection 12 hours later in healthy airway epithelial cells.
Conclusion: The core circadian clock genes maintain rhythmicity in healthy and asthma airway epithelia. Circadian regulation in immune and cytokine signaling pathways is altered in asthma.
Support (if any): Sleep Research Society Foundation Career Development Award (WTP), ATS ASPIRE (WTP), Parker B Francis Fellowship (WTP), NIH R01AI163160 (JSD); NIH K24AI150991 (JSD)

Abstract citation ID: zsae067.0007

0007
A PILOT STUDY EXAMINING THE RELATIONSHIP BETWEEN WORK PRODUCTIVITY AND CIRCADIAN MISALIGNMENT IN NIGHT SHIFT WORK

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Introduction: There has been general agreement that circadian misalignment is a primary driver of poor outcomes associated with night shifts, such as insomnia, excessive sleepiness, and impaired work productivity. However, few studies have utilized gold-standard measures of circadian rhythms (eg, dim light melatonin onset and offset; DLMO and DLMOff) in examining its association with outcomes. This pilot data aimed to examine the magnitude of the relationship between circadian misalignment and work productivity in night shift workers.
Methods: Participants were fixed night shift workers, engaging in at least three shifts per week with their shift beginning between 18:00 and 02:00 and lasting 8 to 12 hours. DLMO and DLMOff were assessed in-lab with 24 hourly salvia collections. Work productivity was measured with the Endicott Work Productivity Scale (EWPS). Circadian misalignment was operationalized as any overlap of DLMO and DLMOff during the participant's work shift. Insomnia and excessive sleepiness were operationalized as a score of 10 or greater on the Insomnia Severity Index (ISI; referenced to daytime sleep) and the Epworth Sleepiness Scale (ESS).
Results: Night shift workers with circadian misalignment reported an EWPS score of 43.2 (SD=12.1), while those without circadian misalignment scored 39.6 (SD=15.6). The Cohen's d effect size was 0.26. In contrast, those with insomnia reported an average EWPS score of 43.9 (SD=13.6) compared to 36.1 (SD=8.5) for those without insomnia (Cohen's d = 0.69). Furthermore, those with excessive sleepiness had an average EWPS score of 44.7 (SD=14.2), versus 39.1 (SD=10.7) for those without excessive sleepiness (Cohen's d = 0.44).
Conclusion: These results suggest that the association between circadian misalignment and work productivity in night shift workers may be smaller than anticipated. Instead, work productivity in night shift worker may be more strongly associated with symptoms of shift work disorder. These data are consistent with evidence that insomnia in non-shift workers are associated with higher absenteeism and presenteeism. This is also consistent with our prior research indicating that symptoms of shift work disorder can be influenced by various factors, including sleep reactivity.

Support (if any): Support for this study was provided from the National Heart Lung and Blood Institute R01HL160870 awarded to Dr. Philip Cheng.

Abstract citation ID: zsae067.0008

0008

WAKE ONSET VARIABILITY EFFECT ON FUNCTIONAL CONNECTIVITY IN THE DEFAULT MODE NETWORK

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Introduction: Decoupling patterns of sleep and wake from underlying circadian oscillations is associated with poor sleep health. While this has been studied with respect to shift work, it is unclear if minor variations in normative sleep/wake patterns affect the restoration of cognitive function during sleep intervals while controlling for total sleep time. It is commonplace to adhere to a fixed sleep/wake schedule, however, this practice does not account for day-to-day variations in physiological need for sleep. We examined the relationship between sleep-interval variability and fMRI resting state functional connectivity while controlling for sleep duration.
Methods: Participants (n=21; 13 female; Age=23.3, SD=4.7) wore an actigraph for 7 days followed by a daytime functional magnetic resonance imaging (fMRI) session. Sleep/wake onset variability was measured from double-rated actigraphy data and cross referenced with sleep journals. Functional connectivity analysis and preprocessing of fMRI images were conducted in the CONN toolbox (SPM12). Seed-based functional connectivity maps were estimated using BOLD activity of the posterior parietal cortex node of the default mode network (DMN) as the seed region. Functional connectivity strength was represented by Fisher-transformed bivariate correlation coefficients from a weighted GLM, modeling the association between the seed and other brain regions.
Results: Wake onset variability (WOV) predicted functional connectivity of the DMN (controlling for age, gender, and sleep duration). WOV was significantly associated (Pthreshold <.005 ; Pfwe <.05) with a higher degree of anticorrelation between the posterior parietal node of the DMN and several regions of the frontoparietal network (FPN): Right superior frontal gyrus, Right mid-frontal gyrus, and Right frontal pole, as well as the occipital cortex and cerebellum. In contrast, sleep onset variability showed no significant changes in functional connectivity within these areas.
Conclusion: Greater WOV was associated with stronger inverse connectivity between the DMN and FPN. This suggests that increased WOV may improve attentional control through greater top-down suppression of the DMN. We speculate that WOV is representative of sleep satiety, resulting in voluntary arousal from sleep, rather than enforced arousal. These results suggest that sleep timing affects attentional control irrespective of duration.
Support (if any): USAMRAA: W81XWH1910074

Abstract citation ID: zsae067.0009

0009

CIRCADIAN PROTEINS AND CIRCADIAN PHASE ESTIMATION IN HEALTHY ADULTS

Adrien Specht[1], Puja Saha[2], Katie Cederberg[2], Flavia Bueno[3], Arturo Arrona-Palacios[4], Enmanuelle Pardilla-Delgado[4], Noelia Ruiz-Herrera[4], Kirsi-Marja Zitting[4], Achim Kramer[5], Jamie Zeitzer[1], Charles Czeisler[4], Jeanne Duffy[4], Emmanuel Mignot[2]
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Introduction: Circadian rhythms, which control sleep-wake cycles and metabolism, are fundamental to human health. Our study aimed to understand how these rhythms affect proteins in the body throughout the day, and to develop a tool that predicts the body's internal clock phase based on protein expression.
Methods: Plasma samples from 17 healthy adults were collected hourly under controlled conditions designed to unmask endogenous circadian rhythmicity; in a subset of 8 participants, we also collected samples across a day on a typical sleep-wake schedule. Using the SomaScan aptamer-based multiplexed platform, we analyzed a total of 6916 proteins were analyzed. We used differential rhythmicity analysis based on a cosinor model with mixed effects to identify a subset of proteins that demonstrates circadian rhythmicity. Finally, we trained a machine learning model to predict the Dim Light Melatonin Onset (DLMO) for a given protein sample.
Results: Four hundred and thirty-one (6.2%) proteins displayed consistent endogenous circadian rhythms on both a sleep-wake schedule and under controlled conditions. This subset not only aligns with the proteins selected by the elastic-net model but also maintains performance without diminishing it in comparison to using the complete set of available proteins. Overall, our circadian phase predictor reached a median absolute error (MdAE) of 1.2 hours when performing a leave-one-cross-out cross-validation subject-wise.
Conclusion: This research demonstrates that a considerable number of plasma proteins follow natural circadian rhythms within the human body. Furthermore, it establishes that the DLMO can be accurately predicted with a MdAE slightly over one hour using a single blood sample. More research with larger and more diverse datasets is essential to confirm our method, promising better treatments for circadian disorders and advancing personalized circadian health care.
Support (if any): Collection, processing, and analysis of the samples were supported by National Institutes of Health (NIH) grant R01 HL148704 and unrestricted gifts. Collection of additional samples was supported by US Office of Naval Research grant N00014-15-1-2408. The BWH CCI is supported by Harvard Catalyst | The Harvard Clinical and Translational Science Center (National Center for Advancing Translational Sciences, NIH Award UL1 TR002541) and financial contributions from Harvard University and its affiliated academic healthcare centers.

Abstract citation ID: zsae067.00010

0010

USING CHRONOTYPE AND POLYGENIC RISK SCORES TO PREDICT AGE OF MOOD SYMPTOM ONSET IN PEOPLE WITH BIPOLAR DISORDER

Alannah Miranda[1], Breanna Holloway[1], William Perry[1], Arpi Minassian[1], Michael McCarthy[1]
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Introduction: Sleep and circadian rhythm disturbances are hallmark features of people with bipolar disorder (BD). Genetic and

preclinical models of BD suggest that disruption of the circadian clock may predispose individuals with BD towards disruption of sleep/wake cycles. Phase delays in sleep/wake cycles are common in BD, causing difficulty initiating morning behaviors. Many people with BD report regularly using cannabis to ameliorate sleep disturbances. Although cannabis has been shown to have sedative properties, cannabis use may also destabilize mood and worsen sleep, and circadian disruption may also increase the risk of problematic substance use. Therefore, it remains unclear how cannabis use impacts sleep and circadian rhythms in people with BD. Here, we determined whether chronotype (self-reported and polygenic scores) and cannabis use disorder (CUD) predicted BD mood symptom onset.

Methods: Participants with BD I (n=309) from the Pharmacogenomics of Bipolar Disorder study were studies. The Diagnostic Interview for Genetic Studies was used to confirm BD and CUD diagnoses. Polygenic scores (PGS) were calculated for chronotype and BD. Basic Language Morningness scale (BALM) was used to assess chronotype. Bivariate correlation analyses were performed between morningness, PGS, and BD symptoms. Multiple regression analyses were performed using gender, morningness, or PGS, and CUD as predictors, and BD symptoms as the dependent variables.

Results: Morningness was not significantly correlated with PGS for chronotype. Higher morningness was positively correlated with onset of manic symptoms ($p< 0.001$) and mean number of mood episodes per year. Both CUD and BALM scores significantly predicted BD age of onset ($p< 0.05$); greater morningness delayed age of onset and patients with CUD had an earlier age of onset.

Conclusion: Consistent with a role in destabilizing mood, CUD use is associated with earlier age of onset, while morningness appears protective, and associated with later age of onset. The study is limited by its cross-sectional and retrospective design. Future studies should continue to explore the interaction of CUD and chronotype in BD patients using cannabis for sleep.

Support (if any): NIDA R01DA043535 and R01DA051295

Abstract citation ID: zsae067.0011

0011

USING POLYGENIC SCORES FOR CIRCADIAN RHYTHM TO PREDICT WELLBEING, DEPRESSIVE SYMPTOMS, CHRONOTYPE, AND HEALTH

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Introduction: The association between the circadian rhythm and diseases has been well-established, while the association with mental health is less explored. Given the heritable nature of the circadian rhythm, this study aimed to investigate the relationship between genes underlying the circadian rhythm and mental health outcomes, as well as a possible gene-environment correlation for circadian rhythm.

Methods: In a sample from the Netherlands Twin Register (N = 14,021), polygenic scores (PGSs) were calculated for two circadian rhythm measures: Morningess and Relative Amplitude. The PGSs were used to predict mental health outcomes such as subjective happiness, quality of life, and depressive symptoms In addition, we performed the same prediction analysis in a within-family design in a subset of dizygotic twins.

Results: The PGS for Morningness significantly predicted Morningness (R2 = 1.55%,) and Depressive Symptoms (R2= 0.22%,). The PGS for Relative Amplitude significantly predicted General Health (R2 = 0.12%,) and Depressive Symptoms (R2 = 0.20%,). Item analysis of the depressive symptoms showed that 4/14 items were significantly associated with the PGSs. The within-family results hinted at a gene-environment correlation for Morningness.

Conclusion: Overall, the results showed that people with a genetic predisposition of being a morning person or a high relative amplitude are likely to have fewer depressive symptoms. Contrarily to our hypotheses, the four associated depressive symptoms described symptoms related to decision-making, energy, and feeling worthless, rather than sleep. Our findings plead for a substantial role for the circadian rhythm in depression research, and to further explore the gene-environment correlation in the circadian rhythm

Support (if any):

Abstract citation ID: zsae067.0012

0012

MORNING MISERY: CIRCADIAN TIMING AND NEGATIVE AFFECT IN A SAMPLE OF ADOLESCENTS

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Introduction: Adolescents with later circadian timing evidence an increased risk for depression. Depressed individuals report higher negative affect (NA), especially in the morning, which may reflect altered circadian timing in NA. Untangling the circadian influences on mood is challenging due to inconsistent operationalizations of circadian timing. This study aims to analyze the associations between three metrics of circadian timing (circadian preference, chronotype, and circadian phase) and daily levels of NA among adolescents.

Methods: This study analyzed 8 days of ecological momentary assessment (EMA) data among 119 adolescents (54.6% female; mean age 17.3 years). Participants completed sleep diaries with a visual analog scale (VAS) measuring NA (0-100; calm-tense) each morning, and the Positive and Negative Affect Scale–Short Form (PANAS-SF) approximately every 3 waking hours. NA scores were averaged across mornings, evenings, and overall. Circadian preference was assessed by the Composite Scale of Morningness (CSM), chronotype by the Munich Chronotype Questionnaire (MCTQ), and circadian phase by salivary dim light melatonin onset (DLMO; 4pg/ml threshold). We conducted multiple regression analyses to examine circadian preference, chronotype, and circadian phase predicting morning (PANAS, VAS), evening, and overall NA (PANAS), controlling for age, sex, and socioeconomic status.

Results: Correlations between circadian metrics were low (rDLMO-MCTQ=.20; rDLMO-CSM=.39; rCSM-MCTQ=.27). Greater evening preference predicted higher morning NA (PANAS: $p=.026$, $\beta=-.21$; VAS: $p< 0.001$, $\beta=-.33$) and evening NA ($p=.032$, $\beta=-.20$), but not overall NA ($p=.106$, $\beta=-.15$). These associations were not significant after isolating the Sleep Timing and Activity factor of the CSM. Later chronotype predicted higher NA on the morning VAS (VAS: $p=.048$, $\beta=.18$), but not on the PANAS ($p=.756$, $\beta=-.03$); chronotype did not predict evening NA ($p=.259$, $\beta=-.11$) or overall NA ($p=.412$, $\beta=-.08$). Circadian phase did not predict morning NA (PANAS: $p=.841$, $\beta=-.02$; VAS: $p=.552$, $\beta=.05$), evening NA ($p=.625$, $\beta=.05$), or overall NA ($p=.391$, $\beta=.03$).

Conclusion: These results highlight the importance of specificity when operationalizing circadian timing and NA, and add to the mixed literature concerning the role of circadian phase in negative mood modulation. Adolescents with later chronotype may be particularly vulnerable to negative mood in the morning. Important next steps involve modeling diurnal patterns of NA and positive affect.
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0013
IMPACT OF CIRCADIAN MISALIGNMENT ON EXECUTIVE FUNCTIONING AND RISK TAKING IN ADOLESCENTS

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Introduction: Circadian misalignment, the discrepancy between one's internal circadian rhythms and one's sleep patterns, is prevalent among adolescents. Circadian misalignment may confer risk for executive function difficulties and risky behavior in teens. This study aims to investigate the impact of experimentally-induced circadian misalignment on executive functioning and risk taking in adolescents.
Methods: Twenty-nine night owl adolescents (14-18 years) underwent a 20-day sleep manipulation protocol, which included two conditions simulating night owl (aligned group) and morning lark (misaligned group) sleep patterns. The study included a 5-night stabilization, 2-night washout, and two 5-day sleep conditions (aligned vs misaligned). Executive functioning and risk-taking were assessed using the Trail Making Task, (an objective executive functioning task), Iowa Gambling Task (an objective risk-taking task), and the Behavioral Inhibition and Behavioral Activation System (BIS/BAS; a self-report measure of both executive function and risk tasking), following each experimental condition. Normality for the dependent variables were assessed using the Shapiro-Wilk test, and statistical comparisons were run with Wilcoxon Signed Rank tests for non-normal variables and paired samples t-tests for normal variables.
Results: The Trail Making Task displayed no significant differences between the aligned and misaligned groups in completion times (p=.108). There were no significant differences between groups on the BAS-drive (p=.522), BAS-fun (p=.273), and BAS-reward (p=.791) sub-components. In contrast, the misaligned group had significantly higher scores on the BIS component (p=.021). Additionally, the misaligned group had higher average total T-scores in risk taking on the Iowa Gambling Task (p=.022).
Conclusion: Our results indicate that those in the misaligned condition showed significantly increased risk-taking in a gambling task (compared to when in the aligned condition), which is consistent with prior findings emphasizing the impact of circadian misalignment on risky behavior. Interestingly, adolescents experiencing circadian misalignment also had elevated behavioral inhibition scores, suggesting that alongside greater behavioral observations of risk taking, they also self-reported to have heightened nervous reactions to expected punishment and increased sensitivity to aversive outcomes. This study enhances understanding of circadian alignment's impact on adolescent decision making, which may inform pre-clinical behavioral interventions aimed to improve adolescent health and well-being.
Support (if any):

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0014
TIME TO STEP UP: THE ROLE OF CIRCADIAN MISALIGNMENT ON ADOLESCENT PHYSICAL ACTIVITY METRICS

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Introduction: Circadian misalignment, the discrepancy between internal circadian timing and sleep timing, impacts overall health and well-being. While past research emphasizes the connection between physical activity and sleep duration, we aim to examine differences in physical activity levels and abilities in adolescents experiencing experimentally manipulated circadian-aligned versus misaligned sleep conditions.
Methods: 29 night-owl adolescents underwent both aligned (12:30am-9:30am) and misaligned sleep (9:30pm-6:30am) for five nights each, with order randomized. To determine adherence to study protocols, wrist accelerometers tracked sleep duration and timing and waist accelerometers measured physical activity. After each experimental period, participants completed the 6-minute walk test and a sit-to-stand test. Repeated measures t-tests were used to assess the impact of the circadian timing condition on minutes in sedentary behavior, minutes in moderate-to-vigorous physical activity (MVPA), 6-minute walk distance, and sit-to-stand repetitions.
Results: Participants in the aligned condition significantly outperformed the misaligned group in sit-to-stand repetitions (M=24.10, SD=8.978; M=19.72, SD=6.524, respectively; p=0.003, d=0.616). Additionally, 6-min walk results revealed a significant difference, with participants in the aligned condition walking significantly farther than the control group (M=0.2952, SD=0.13095; M=0.2331, SD=0.10674, respectively; p=0.011, d=0.503). There was no significant difference between aligned and misaligned conditions in MVPA or sedentary behavior.
Conclusion: Participants undergoing circadian alignment had significantly better performance in walking and sitting tasks compared to when they were misaligned; there was no impact of circadian timing on physical activity levels across the week. These results could have significant implications for how teen athletes train and compete. Specifically, aligning teen athlete's school and sport training and competition schedules with their circadian rhythm might lead to better performance.
Support (if any):

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0015
FEASIBILITY OF AN AT-HOME EXPERIMENTAL CIRCADIAN MISALIGNMENT INDUCTION FOR ADOLESCENTS

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Introduction: For many adolescents, the only practical way to lengthen sleep on school nights is an earlier bedtime. However, this can be misaligned with their circadian phase. The effects of

circadian misalignment remain understudied. Here, we present preliminary findings from an ongoing experimental trial comparing sleep extension that is aligned vs. misaligned with adolescents' circadian phase.
Methods: Healthy 14-18-year-olds in the bottom and top quartile of reported midsleep on non-school nights ("lark" vs "owl" chronotype) underwent a 3-week protocol with three multi-night periods at home: 8-hours/night of sleep opportunity aligned with their chronotype (Week1), 6.5-hours/night centered between chronotypes (Week2), and 9.5 hours/night randomly assigned to early bedtime or late risetime conditions (Week3). Linear mixed models compared Dim Light Melatonin Onset (DLMO, collected at the end of each week) and sleep midpoint and duration (via wrist actigraphy) across week, chronotype, and random assignment during Week3 (early vs late sleep extension). Alpha was set at .01.
Results: Of 68 adolescents randomized, 57 (84%) completed the protocol (Mean age=15.9, 53% female). At Week1, larks and owls markedly differed in midsleep (03:16 vs 05:38) and DLMO (21:18 vs 23:30), ps<.001, with midsleep and DLMO correlating well (r=.76, p<.001). By design, sleep duration markedly differed across weeks (7.7 vs 6.4 vs 8.5 hours; p<.001) without any significant interactions involving chronotype or randomization. Sleep midpoint and DLMO each showed week-by-randomization interactions (ps<.001) but no 3-way interactions. By design, late risetime significantly delayed midsleep in Week3 only (p<.001). Week-by-week follow-up tests of the randomization effect on DLMO were non-significant. Sleep midpoint showed a week-by-chronotype interaction (p<.001), with later midsleep for owls pre-randomization (ps<.003), but not during Week3. Midsleep at Week3 and subsequent DLMO correlated well for adolescents who were randomized to a condition that aligned with their chronotype (r=.70, p<.001), but not those randomized to a misaligned condition (r=.26, p>.2).
Conclusion: It is feasible to experimentally induce sleep patterns that meet recommendations for healthy sleep duration but are aligned or misaligned with individual adolescents' circadian phase. We will use this protocol to study the effect of circadian misalignment on health outcomes.
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0016

IN SEARCH OF VITAMIN SLEEP: VITAMIN AND MINERAL INTAKE AND MULTIMODAL SLEEP OUTCOMES IN ADOLESCENTS

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Introduction: Previous studies suggest that under 15% of adolescents regularly consume vitamin- and mineral-rich foods such as leafy greens and legumes. In addition to experiencing poor dietary intake, this developmental group is also subject to high rates of insufficient sleep duration (~70%). Thus, adolescents may be especially susceptible to the influence on micronutrient deficiencies on poor sleep. This study seeks to generalize previous adult findings to an adolescent population who may especially benefit from multimodal therapies targeting poor sleep and diet in tandem.
Methods: Seventy-four adolescents (43 females) ages 14-18 submitted 2-3 dietary recalls on randomized weekends and weekdays. Additionally, participants completed a Dim-Light Melatonin Onset (DLMO) appointment, the Epworth Sleepiness Scale for Children and Adolescents (ESS-CHAD), and the Pittsburgh Sleep Quality Index (PSQI). Possible associations between vitamin (Folate, Folic Acid, Niacin, Retinol, Riboflavin, Thiamin, Vitamins A, B-6, B12, C, D, E, and K) and mineral (Calcium, Copper, Iron, Magnesium, Phosphorus, Potassium, Selenium, and Zinc) intake and melatonin onset time (DLMO, threshold 4 pg/mL), daytime sleepiness (ESS-CHAD total), and self-reported sleep duration (PSQI Item 4) were evaluated using multiple bivariate regression models.
Results: Following correction for multiple comparisons, no vitamins or minerals were found to be significant predictors of sleep quality outcomes. B12 approached significance for predicting DLMO time (beta=.337, t(64)=2.367, p=.021; R2 = .073, F(3,61)=2.684, p=.054) and daytime sleepiness (beta=.334, t(72)=2.517, p=.014; R2 = .065, F(3,69)= 2.662, p=.055), as did Magnesium for daytime sleepiness (beta=-.284, t(73)=-2.349, p=.022; R2 = .057, F(3,70)=2.481,p=.068) and Zinc for DLMO time (beta=.369, t(65)=2.562, p=.013; R2 = .083, F(3,62)=2.961, p=.039).
Conclusion: Vitamin and mineral intake was not significantly related to self-reported sleep outcomes and DLMO in adolescents. Future studies can examine dietary intake in conjunction with more objective physiological measures of sleep health. Failure to meet RDA in this age group presents limitations when studying the effects of increased consumption. Other study designs could incorporate B12, magnesium, and zinc measurement given potential signal.
Support (if any):

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0017

CIRCADIAN PHASE ALIGNMENT AND SLEEP DURATION IN OVERWEIGHT ADULTS: ASSOCIATIONS WITH CARDIOMETABOLIC RISK FACTORS

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Introduction: Both short sleep duration and circadian rhythm misalignment are associated with increased cardiometabolic risk factors. Although experimental research has demonstrated the independent and interactive effects of these two exposures, few studies have examined the interaction between these two factors on outcomes among free-living participants. The goal of this study is to examine how sleep duration and circadian alignment predict cardiometabolic risk factors and extend prior research by examining the mechanisms of insulin resistance.
Methods: Participants included adults aged 18-60 y with BMI 25-35 kg/m2 who completed body measurements, at least 7 days of actigraphy and an in lab dim light melatonin onset assessment (DLMO). The main measure of circadian misalignment was the phase angle, or duration between DLMO and habitual sleep onset time in the past 7 days. Participants attended an outpatient visit to the clinical research unit to complete a frequently sampled intravenous glucose tolerance test (FSIVGTT) and data were analyzed using Bergman's minimal model analysis. Multivariable linear regression models evaluated the effects of

sleep duration both individually and their interaction in predicting cardiometabolic outcomes in models controlling for age, sex, race and ethnicity.
Results: Body measurement data were available for n= 92 participants and FSIVGTT were available for 87 participants (age: M= 36 SD=10 years, 47 female). Average sleep duration was 6.9 hours (SD=0.6) and average phase angle was 3.3 hours (SD=1.0). We found there was higher insulin sensitivity among those with shorter phase angle (Si, estimate= -2.58 CI= -4.63, -0.53 (mU/L)-1min-1, p=.02) and a trend among shorter sleep duration (estimate = -3.71, CI= -7.35, -0.07 (mU/L)-1min-1, p=.05). Phase angle and sleep duration were not associated with metabolic measures, BMI, body fat or hip/waist ratio.
Conclusion: Results demonstrate contrary to our hypotheses, shorter phase angle and sleep were associated with higher insulin sensitivity and unrelated to other cardiometabolic risk markers in our sample of overweight adults without diabetes.
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0018
EXTROVERSION PREDICTS HIGHER EVENING CALORIC INTAKE

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Introduction: Personality has been shown to predict health-related outcomes, including eating behavior. However, the findings on extroversion and caloric intake have been inconsistent. This study sought to examine whether trait extroversion predicted total caloric intake, as well as calories from specific macronutrients, at different times of day during a sleep deprivation protocol.
Methods: Participants (n=46; 23 women) conducted a baseline personality assessment before completing a 30-hour sleep deprivation protocol a week later. The laboratory visit began at 6pm, and participants departed the following day at 2pm. While in the lab, participants completed serial neurocognitive assessments and engaged in ad libitum feeding. Caloric intake was assessed in 6-hour bins from 6pm (start of laboratory protocol) until 12am, 12am-6am, and 6am-12pm. Multivariate regression models were used with extroversion as the primary predictor (assessed via NEO Personality Inventory scores) and primary outcomes including total caloric intake, calories from total carbohydrates, sugars, protein, total fat, saturated fat, and transfats. Models were adjusted for age, sex, BMI, and chronotype (assessed using the Morningness-Eveningness Questionnaire (MEQ)).
Results: The fitted regression model with extroversion as the primary predictor and food variables as outcomes was statistically significant for total carbohydrates ($F(4,40) = 3.153$; $R2 = 0.164$; $p = 0.024$) and total calories ($F(4,40) = 3.179$; $R2 = 0.165$; $p = 0.023$) consumed between 6pm and midnight, adjusted for age, sex, and BMI. Extroversion was positively associated with greater total carbohydrates (β (3.148) = $p < 0.0174$) and greater total calories (β (22.088) = $p < 0.0057$) consumed between 6pm and midnight. Chronotype did not predict food intake in models further adjusted for MEQ score.
Conclusion: Trait extroversion may be associated a greater propensity for hedonic eating behavior, thus leading to higher caloric intake. However, it may also be that in a laboratory setting where social interactions are limited, extroversion predicts the consumption of foods as a self-soothing strategy in the event of loneliness. Further investigation is needed to understand this association in real world settings.
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0019
BODY WEIGHT REDUCTION FOLLOWING 8-WEEKS OF TIME-RESTRICTED EATING IN PERI- AND POSTMENOPAUSAL WOMEN WITH OBESITY

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Introduction: Many women experience weight gain due to hormonal changes during menopause. Time-restricted eating (TRE) has been proposed as a dietary intervention to reduce body weight but has not been studied extensively during the menopause transition. We aimed to test the effect of TRE on body weight and composition in peri- and recently (< 5 yrs) postmenopausal women with obesity.
Methods: Participants were recruited from the New England area. To date, 23 women (mean age±SD: 51.9±4.1 yrs; mean BMI±SD: 34.9±3.2 kg/m2) have been randomized to 8-weeks of unrestricted eating (URE; n=11) or TRE (n=12), where participants were instructed to consume calories only during a self-selected 8-hour eating window each day (e.g., 10 am-6 pm). Outcomes included body weight, body composition [fat, fat-free and visceral adipose tissue (VAT) mass, measured via dual x-ray absorptiometry], and 7-day caloric intake [kCal/day; per MealloggerTM app with time-stamp]. Change from baseline to post-intervention was compared between the groups using t-tests.
Results: On average, the TRE eating window was 4.1±0.7 (95%CI 2.7 to 5.6) hours shorter than the URE group ($p< 0.001$; 7.1±0.2 vs. 11.2±0.7 hours, respectively). Compliance with the daily 8-hour TRE eating window (average compliance 93±6.9% of days) and acceptability (11/12 planned to continue TRE after study completion) were high. Despite no statistically significant between-group difference in calorie intake (1515.8±561.7 vs 1430.0±419.6 kCal/day), the TRE group lost an average of 2.4±0.6 kg (SD), significantly more than the URE group who gained an average of 0.46±0.4 kg ($p< 0.01$; mean difference=2.8±0.7, 95%CI -4.4 to -1.3). Furthermore, there was a trend toward a greater reduction in fat mass in the TRE (-0.7±0.4 kg) compared to URE group (0.65±0.6 kg) ($p=0.059$; mean difference=1.4±0.7 kg, 95%CI -2.8 to 0.06). Change in fat-free and VAT mass did not differ.
Conclusion: In this interim analysis of an ongoing trial, 8 weeks of TRE led to a reduction in body weight and possibly fat mass in peri- and postmenopausal women with obesity. Importantly, compliance and acceptability of the diet were high, suggesting that the intervention is feasible and sustainable in this population.
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0020

HEART RATE VARIABILITY CHANGES DURING SLEEP IN POSTMENOPAUSAL WOMEN

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Introduction: Young women present a lower risk of cardiovascular disease (CVD) than age-matched men, but this risk steeply increases at menopause. Heart rate variability (HRV) has been proposed as a marker of cardiovascular health, which changes with circadian phase and menopause. We aim to understand the changes in the circadian variation of HRV that occurs in postmenopausal women.
Methods: Eight healthy PMW (54.8±3.4 years, one taking hormones) and 12 healthy young women (YW; 25.8±3.4 years) in their mid-follicular phase were enrolled. Participants were healthy sleepers. After a regular 8-h sleep schedule at home for ≥2 weeks, participants entered the laboratory. After a baseline nocturnal sleep period, they underwent a 48-h (PMW) or 72-h (YW) ultradian sleep-wake cycle procedure (USW) consisting of alternating 60-min wake and nap opportunities. Sleep was polysomnographically recorded. EKG recordings were used to calculate HRV parameters: heart rate (HR), SDNN, RMSSD, HF. Circadian parameters (mesor, amplitude, phase) were calculated by fitting a cosinor to HRV parameters during the first 24 naps of the USW. Linear mixed-effects models were used for between-group comparisons.
Results: During the hourly analysis of the baseline sleep period, PMW presented lower SDNN, RMSSD and HF compared to YW ($p \leq 0.025$), with no differences in HR. PMW also had lower SDNN, RMSSD, and HF throughout N2, N3, REM sleep, and wake epochs ($p \leq 0.013$). During the USW procedure, YW showed a significant circadian variation of HR during NREM sleep and wake, and HF during NREM sleep ($p \leq 0.010$), whereas these variations were not significant in PMW. Both groups presented a significant circadian variation of SDNN in NREM sleep and wake ($p \leq 0.037$), with no differences in amplitude or phase. PMW also presented a lower mesor of SDNN, RMSSD and HF ($p \leq 0.024$).
Conclusion: The lower HRV (SDNN) and parasympathetic activity (RMSSD and HF) during the sleep of PMW is consistent with the increased risk of developing CVD after menopause. Furthermore, the dampened circadian variation of HR and HF in PMW suggest a weakened circadian regulation of the cardiovascular system. This could be a mechanism involved in the increased CV risk after menopause, although this would require further investigation.
Support (if any): Canadian Institutes of Health Research.

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0021

EFFECTS OF PHARMACOLOGICAL ESTRADIOL SUPPRESSION ON URINARY 6-SULFATOXYMELATONIN OUTPUT IN PREMENOPAUSAL WOMEN

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Introduction: The relationship between the female sex steroid estradiol and the pineal hormone melatonin has been hypothesized to be reciprocal, whereby estradiol is low when melatonin is high and vice versa. Results from human studies have been mixed, however, which may be attributable to the large inter-individual differences in overall levels of melatonin secretion between individuals. Furthermore, menopause, characterized by declining levels of estradiol, has been associated with decreased levels of melatonin, although the contributions of ovarian aging versus chronological aging on melatonin levels is not clear. In the current within-subject experimental study of premenopausal women, we aimed to examine the effects of pharmacologically-induced estradiol suppression on the 24-hour output and circadian rhythm characteristics of the urinary melatonin metabolite,6-sulfatoxymelatonin(aMT6s),therebyisolatingestradiol-related effects from those if chronological aging.
Methods: Urine was collected every 3-4 hours during the daytime and 8-10 hours overnight over ~24 hours during a laboratory study from 12 premenopausal women (mean age±SD= 27.9±5.6 yrs) during their mid-to-late follicular phase when estradiol levels were high (i.e., estrogenized state), and again ~6 weeks later following pharmacologically-induced estradiol suppression (i.e., hypo-estrogenized state) due to administration of the gonadotrophin releasing hormone agonist, leuprolide (3.75mg intramuscular injection). Morning single-timepoint serum estradiol levels, 24-hour aMT6s output, and the cosinor analysis-derived mesor, amplitude and acrophase of the aMT6s rhythm were compared between the estradiol states using paired t-tests or non-parametric alternative.
Results: As expected, leuprolide suppressed estradiol levels by ~90% on average compared to levels in the mid-to-late follicular phase ($p < 0.001$; 120.7±43.4 vs. 5.6±0.6 pg/mL, respectively, Cohen's d= 1.1). On average, 24-h aMT6s output was 5.3% higher following estradiol suppression but this was not significantly different from the estrogenized state ($p=0.4$; 16.1±5.7 vs. 15.4±1.6 µg/24-h, respectively, Cohen's d= 0.12). Similarly, there were no differences in any of the aMT6s rhythm characteristics between estradiol states.
Conclusion: In a within-subject analysis, pharmacologically-induced estradiol suppression did not influence the overall 24-h output or rhythm characteristics of urinary 6-sulphatoxmelatonin, suggesting that that melatonin and estradiol may not be reciprocal. Furthermore, these results suggest that the decline in melatonin observed across menopause may not be due to ovarian aging.
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0022

DAILY RHYTHMS OF FRACTAL MOTOR ACTIVITY REGULATION IN OLDER ADULTS: RELEVANCE TO PREDICTION OF ALZHEIMER'S DEMENTIA

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Introduction: Fractal motor activity regulation (FMAR), characterized by self-similar temporal correlations in activity fluctuations across different timescales, is robust in healthy young but degrades in patients with Alzheimer's disease (AD). We recently

discovered that disrupted FMAR predicted increased risk for AD dementia. It is unknown whether FMAR and its predictability for incident AD vary across the 24-h cycle.
Methods: We studied 1,077 participants in the Rush Memory and Aging Project who were cognitively normal at baseline, had baseline actigraphy, and had at least one follow-up clinical assessment until 2020. To assess the daily rhythm of FMAR, we obtained a scaling exponent α in each 1-h actigraphy data that estimates the temporal correlations in activity fluctuations across timescales of 1.5-10 min, using detrended fluctuation analysis (DFA). For each 1-hour bin across the 24-h cycle, we used a Cox regression model to examine the association of scaling exponent α with incident AD while adjusting for age at baseline, sex, and years of education. The p-values were corrected using Bonferroni correction for the 24 hourly comparisons.
Results: The scaling exponential α from DFA showed a daily rhythm with a trough at 3am (α=0.71) and a peak at 3pm (α=0.84). The hazard ratio (HR) for incident AD (per 1-SD increase in α) also showed a daily rhythm. Specifically, smaller α (indicating more random activity fluctuations) between 7am to 10pm was associated with an increased risk of incident AD (HR ranging from 0.59 [95% CI 0.50-0.70, p < 0.001] to 0.79 [95%CI 0.69-0.91, p = 0.0013], lowest at 3pm); α between 11pm-6am was not significantly correlated with incident AD.
Conclusion: Fractal motor activity regulation in older adults exhibited a daily rhythm and more random activity fluctuations between 7am-10pm were predictive of higher risk for AD dementia.
Support (if any): NIH RF1AG064312 and BrightFocus Foundation Alzheimer's Research A2020886S.

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0023

LIGHT- AND MEAL-INDUCED PHASE RESETTING OF CIRCADIAN LIPID RHYTHMS IN HUMANS

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Introduction: We have characterized endogenous circadian rhythms in total cholesterol (TC), high-density lipoprotein cholesterol (HDL-C) and triglycerides (TG) and shown that they can be reset according to a Type I phase response curve (PRC) by a combined stimulus of light exposure and meals. The resulting PRCs are different in phase and amplitude than that describing melatonin rhythm resetting and therefore we hypothesized that lipid rhythms may be reset by meal timing rather than light. In the current study, we are constructing three PRCs that systematically examine the contribution of light and/or meal timing on the circadian resetting response of lipids.
Methods: To date, 15 young healthy adults (mean age±SD= 25.9±3.6 yrs, 7F) have been randomized to one of three stimulus conditions: Light + Meals (n=5): 6.5-h ~10,000 lux white light exposure with a 12-h meal window; Meals only (n=4): dim light (< 3 lux) with a 12-h meal window; or Time-restricted Meals (n=6): dim light with a 6.5-h meal window. Individuals are randomized to one of 16 stimulus times distributed every 90-minutes (~22.5◦) across the 24-hour day. Cosinor analysis was used to assess 24-h rhythms in lipids measured during constant routines conducted before and after stimulus administration. Phase shifts were calculated as the difference between pre- and post-stimulus acrophase.
Results: Endogenous circadian rhythms were observed in 73%, 86% and 100% of participants for TC, HDL-C and TG, respectively, during the first CR. These percentages were similar for the second CR: 80% for TC and HDL-C and 93% for TG. Consistent with our previous work, TC and HDL-C peaked in the afternoon (~15:30), whereas TG peaked in the early morning (~03:30). TC, HDL-C and TG demonstrated both advance (up to 7.1 hours) and delay (up to 8.9 hours) phase shifts depending on the circadian time of stimulus administration that were broadly consistent with our published PRCs.
Conclusion: Once completed, these PRCs will differentiate the role of light versus meals in resetting lipid rhythms, and the impact of meal window duration. This work is essential for providing evidence-based advice to shift workers and others with circadian misalignment to reduce their risk of lipid rhythm desynchrony.
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0024

MEASURING MELANOPSIN-DRIVEN RETINAL RESPONSES IN SLEEP AND CIRCADIAN HEALTH: PERFORMANCE OF THE PUPIL LIGHT REFLEX

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Introduction: Alterations in the melanopsin-driven post-illumination pupil response (PIPR) may reflect a physiological vulnerability for circadian mood disruptions. However, the PIPR is confounded by other factors affecting retinal irradiance, like how much light reaches the retina. The pupil light reflex (PLR) measures effects on pupil responses that are nonspecific to melanopsin. Controlling for nonspecific factors related to retinal irradiance (i.e., age, entrance pupil diameter, iris pigmentation) is necessary to isolate melanopsin-driven retinal response in PIPR studies. The present study re-analyzed data using group, season, and a group-by-season interaction to predict the PIPR with different covariates testing nonspecific effects on the PIPR. We hypothesized that the PLR alone would explain more variance in the PIPR then the above set of indirect measures of nonspecific effects.
Methods: Participants ages 19-65 (M=34.9, SD=10.6) with seasonal depression (n=25) and non-depressed controls (n=22) completed assessments in the winter and summer months. The PLR was measured as the difference between baseline pupil diameter and the acute minimum constriction in millimeters and expressed as a percent of baseline. The Net PIPR was calculated as the difference between the red and blue trials averaged 10-40 seconds post-light stimulus. Iris pigmentation was rated using the Franssen (2008) scale. Model performance for different covariate sets was assessed using Akaike Information Criteria (AIC). All models included time of the PIPR relative to midsleep.
Results: Significant associations between group, season, and a group*season interaction in predicting the PIPR were found in every model. Model fit varied based on covariates included. The

PLR following red light performed best in models predicting the PIPR (AIC=-161.63) compared to a model including age, entrance pupil diameter, and iris pigmentation (AIC=-144.98). The next best fit model included the PLR in response to blue light (AIC=-157.57).
Conclusion: Studies aiming to isolate melanopsin-driven retinal responsivity should adopt the PLR as an individually specific, objective, and contemporaneous measure of nonspecific influences of light on pupil responsivity. Methodology separating the effects of light incident on the retina (e.g., PLR) from melanopsin-driven retinal responses (e.g., PIPR) can inform treatments like bright light therapy, allowing titration of light intensity to account for individual differences in retinal irradiance.
Support (if any):

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0025
CIRCADIAN PHASE SHIFTS AFTER TRANSMERIDIAN TRAVEL IN THE OPERATIONAL ENVIRONMENT

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Introduction: Circadian misalignment is detrimental to health and performance– decrements that can be exacerbated by rapid transmeridian travel. Such travel is unavoidable in military operations but can itself negatively impact the likelihood of mission success. To date, there are few studies assessing the impact of travel on the physiology and operational performance of military personnel. In the present study, salivary dim light melatonin onset (DLMO) is used to assess the extent to which circadian rhythms are impacted by transmeridian travel and round-the-clock missions.
Methods: Participants were 23 active-duty male Soldiers aged 23.2 ± 2.8 years (M ± SD). Baseline data were collected in the Hawaii Standard Time (HST) Zone. This was followed by rapid deployment to the Eastern Daylight Time Zone for one pre-mission day, followed by a 72-hour live-fire exercise, and two post-mission days. Salivary melatonin was assessed via a modified constant routine at baseline, upon arrival to the EDT zone, and again on the first post-mission day, with 12 passive drool saliva samples collected every 30 minutes from 1830 to 0000 hours under dim light (< 10 lux) and sedentary conditions. Participants abstained from food and drink (except for water) during the assessment. The circadian phase shift for the mission was calculated as the time difference between baseline and post-mission DLMO.
Results: During the pre-mission day, 19 participants displayed the anticipated melatonin suppression (no DLMO) upon arrival to the EDT zone. During the mission, 15 Soldiers had a circadian phase delay [~66 min (±72 min), (M ± SD)], and 8 Soldiers had a circadian phase advance [~90 min (± 96 min), (M±SD).
Conclusion: As anticipated, participants' circadian rhythms were misaligned with the local day immediately upon arrival to the EDT. For all but 1 participant, circadian timing at post-mission was similar to circadian timing at baseline. Further analyses are underway to determine the extent of misalignment on the pre-mission day resulting from travel. Further research is needed to assess the extent to which transmeridian travel and round-the-clock operations impact circadian misalignment, rate of adaptation to the new time zone, and operationally relevant performance.
Support (if any): DoD MOMRP; DEVCOM-SC

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0026
NIGHT SHIFT SLEEP AND ENERGY MANAGEMENT VIA LIGHT THERAPY: A DOUBLE-BLINDED, PLACEBO CONTROLLED STUDY

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Introduction: Lumos Smart Sleep Mask emits short light pulses during sleep aiming to pre-align and re-align the user's circadian rhythms during travel, night shifts and other short-term and long-term circadian clock disruptions. In an earlier DoD-funded, counterbalanced, double-blinded, placebo-controlled lab study, the Lumos Mask was shown to induce circadian phase shifts determined by DLMO assessment. This study is a DoD-funded field study on healthy night shift workers to investigate the impact of Lumos Mask on sleep and alertness during night shifts.
Methods: The study involved 15 healthy night shift workers aged between 18 and 65 who underwent multiple rounds of night shift rotations under multiple conditions. The conditions included: 1) No intervention 2) Lumos Mask + sham program 3) Lumos Mask + active light programs. Sleep data was collected by Dreem headband, Fitbit Charge 5, as well as self-report questionnaires. Alertness through reaction time was measured by the Psychomotor Vigilance Test (PVT), Karolinska Sleepiness Score (KSS), and other self-report questionnaires.
Results: Preliminary findings demonstrated a consistent trend indicating the mitigation of adverse effects associated with night shift work on sleep and alertness. Participants demonstrated higher alertness and higher functionings during night shifts. When working on night shifts, participants demonstrated better perceived sleep quality, accompanied by longer sleep duration and less early awakening. During post-shift recovery sleep, participants experienced shorter sleep onset latency, shorter awakening, and better overall perceived sleep quality.
Conclusion: Taken together, the lab study and the field study demonstrated the effectiveness of the Lumos Mask in regulating human circadian clocks. The personalized light pulses in the Lumos Mask offer a great potential in improving the sleep and performance for individuals experiencing circadian clock disruptions.
Support (if any): The DLMO lab study and the night shift field study were funded by the Department of Defense under Contract Number H9240521

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0027
PERSONALIZED LIGHT THERAPY FOR NIGHT SHIFT WORK: A PRECISION MEDICINE APPROACH TO REDUCING INSOMNIA AND SLEEPINESS

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Introduction: Night shift workers experience symptoms of excessive sleepiness and insomnia due to misalignment between their circadian clock and work schedule. Circadian misalignment can be corrected using exposure to bright light delivered in accordance with a phase response curve. Our prior data indicate that a light schedule personalized to an individual's melatonin rhythms produces greater reductions in circadian misalignment compared to a one-schedule-fits-all approach. This randomized controlled trial extends prior findings by examining the effect of personalized light therapy on symptoms of shift work disorder.
Methods: Individuals with shift work disorder (ICSD-3 diagnostic criteria) were randomized into two conditions: personalized light therapy (n = 14), or a non-personalized light therapy control (n = 7). Personalized light schedules were based on estimates of dim light melatonin onset (DLMO) derived from mathematical modeling of data collected via an Apple Watch. Light schedules were delivered through a mobile app (Arcashift) that updated in accordance with real-time estimates of DLMO. Estimates were confirmed with in-lab DLMO. Participants were provided light blocking glasses and a light box as source of bright light at night. Sleepiness (Karolinska Sleepiness Scale) and insomnia (Insomnia Severity Index) were assessed before and after treatment, and analyses evaluated change scores from pre- to post-treatment.
Results: Those in the personalized light therapy group demonstrated decreased insomnia symptoms during daytime sleep (mean = -4.64, SD = 8.03) compared to those in the non-personalized control (mean = 3.57, SD = 5.38), $p < 0.05$. The personalized light therapy group also achieved a decrease in peak sleepiness (mean = -0.21, SD = 0.68) compared to the control (mean = 0.77, SD = 0.76), $p < .001$.
Conclusion: Preliminary results suggest that personalizing light therapy according to the individual's specific circadian phase may be more effective in improving symptoms of insomnia and sleepiness by delivering treatment. Future research should examine other occupational and health outcomes associated with a personalized approach to light therapy.
Support (if any): Support for this study was provided from the National Institute of Health R41HL163783 and the American Academy of Sleep Medicine Foundation (245-SR-21) awarded to Drs. Philip Cheng and Olivia Walch.

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0028

CHRONOTYPE AND CIRCADIAN TIMING IN DAY AND CHRONIC NIGHT-SHIFT WORKERS

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Introduction: In populations who live and work typical day-shift work hours, chronotype (i.e., morning lark or night owl) is tightly associated with dim-light melatonin onset (DLMO) timing, the gold standard marker of circadian phase. The association between these markers is less clear in populations chronically working fixed, overnight shift work schedules which may be vital for making population-based recommendations. We therefore examined the relationship between chronotype and DLMO in chronic, fixed overnight shift working nurses compared to fixed day-shift working nurses.
Methods: Sixteen volunteers (15 female; aged [average ± SD] 31.8±7.7yr) working either a fixed day (n=8) or nightshift schedule (n=8; 19:00-07:00 shift; duration of night-shift work 8.6 ± 7.2yr) participated in an ~8h evening in-laboratory stay in dim-lighting (< 5 lux). Beginning at 17:00, saliva was collected every 30 minutes to calculate circadian phase via salivary DLMO (3pg/ml threshold). Chronotype was determined via daily sleep/wake diaries collected over 7-days and defined as mid-sleep time on free days corrected for sleep loss on participant-identified work days (MSFsc). Pearson Correlations were used to determine associations between DLMO and MSFsc within each work-schedule group and circadian timing between groups was compared using Independent T-Test. DLMO was not captured in two night-shift working participants, thus they were not included in DLMO analysis.
Results: The timing of MSFsc and DLMO were significantly correlated such that later mid-sleep timing was correlated with later DLMO timing in day-shift ($r=0.77$, $p< 0.025$), but not night-shift ($r=0.005$, $p=0.99$) workers. Moreover, the average MSFsc (01:25± 0:45 vs 11:16±01:35; $p< 0.001$) and DLMO timing (19:13±01:04 vs 21:12±01:01; $p=0.005$) of the day-shift nurses were significantly earlier than the night-shift nurses.
Conclusion: Working and living on a day-shift schedule results in an association between chronotype and circadian timing, while a stable night-shift schedule results in no discernable relationship between the measures, despite a later DLMO timing. Understanding the connection between these sleep and circadian measurements could have implications for interventions to improve sleep, health, and performance in shift-working populations.
Support (if any): OHSU School of Nursing PhD Student Scholarship Award, T32HL083808, K01HL146992

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0029

BIMODALITY IN UNDERGRADUATE STUDENTS IS ASSOCIATED WITH NEGATIVE HEALTH AND SLEEP OUTCOMES

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Introduction: The bimodal chronotype is a fourth circadian phenotype proposed by re-scoring the Morningness-Eveningness Questionnaire as first described by Martynhak and colleagues in 2010. Bimodal subjects are classified as "intermediate", but they answer some of the questions as a morning person and others as an evening person. The present work aimed to describe the prevalence of the bimodal chronotype in a sample of undergraduate students in the city of Sao Paulo and to characterize the bimodal type in terms of their health and sleep-related outcomes.
Methods: A web-based cross-sectional study conducted between September 2018 and March 2021, using a convenience sampling method. The sample was composed of undergraduate students from two higher education institutions in Sao Paulo, who completed an electronic form that included the Morningness and Eveningness Questionnaire, the Pittsburgh Sleep Quality Index, the Self-Compassion Scale, the Epworth Sleepiness Scale, the Hospital Anxiety and Depression Scale, and the World Health Organization Subjective Well-Being Index. The final sample consisted of 615 students (82% female, mean age: 23.4±6.5 years).
Results: Of the 615 students, 108 (18%) had positive bimodality indexes. Bimodal subjects comprised 48 students (79% female, 19% male, 2% other gender), 8% of the total sample. Bimodal

subjects had poorer subjective sleep quality ($F(3,598)=20.0$ $p< 0.001$), more daytime sleepiness ($F(3,611)=7.1$ $p< 0.001$), lower subjective well-being ($F(3,611)=14.0$ $p< 0.001$), greater anxiety ($F(3,611)=9.6$ $p< 0.001$) and depression symptoms ($F(3,611)=11.8$ $p< 0.001$), and lower self-compassion ($F(3,611)=10.1$ $p< 0.001$) than morning and/or intermediate types. However, they did not differ from evening types.

Conclusion: We found a bimodality prevalence of 8% and show that this profile is associated with negative health and sleep outcomes. The description of bimodality prevalence in a sample of college students is interesting because they are often an at-risk population for abnormal sleep and circadian disruption, which may be of interest for the design of academic public policies more consistent with the circadian reality of students.

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0030

GENE EXPRESSION AND ATTENTION LAPSES WITH A COUNTERMEASURE FOR SLEEP LOSS

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Introduction: Few studies have investigated the association between genetic and neurobehavioral performance changes during sleep loss, or how that relationship may be impacted by wakefulness promoting agents. We hypothesized that we could associate gene expression with impairment during sleep deprivation, both with and without use of the countermeasure modafinil.
Methods: Healthy young adults (N=19) were exposed to total sleep deprivation for ~36 hours on each of two separate study runs. On one night, each participant received 200 mg of modafinil, and during the other night, they were given a placebo. Objective performance was assayed with the Psychomotor Vigilance Test (PVT), Delayed Match to Sample, and Rapid Decision Making Test, along with self-reported fatigue on the Profile of Mood States questionnaire. Whole transcriptome sequencing data of blood samples drawn every 4 hours (N=8 times per subject) were analyzed with generalized linear modeling for associations of gene expression with neurobehavioral metrics.
Results: Performance was impaired during sleep loss, with maximum values of PVT lapses reaching over 10 attention lapses in ~90% of subjects. Modafinil served to mitigate the impairment. In models including circadian rhythms, we discovered 232 genes significantly associated with PVT lapses in the placebo run, but zero genes in the run with administration of modafinil. Limited overlap was found between biomarker genes associated with PVT, and genes related to other neurobehavioral assays.
Conclusion: Genetic findings include potential molecular biomarkers for neurobehavioral effects of sleep loss, and reproducible findings of select genes in prior work reveals strong candidate gene biomarkers for attention impairment during sleep loss. Differences in molecular associations across neurobehavioral tests suggests the potential to develop tailored genetic panels for specific types of neurobehavioral changes. However, the use of modafinil greatly diminished not only attention lapses but also the association of gene expression with attention impairment. These findings demonstrate the importance of considering background countermeasure use in development of biomarker panels.
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0031

SHARED GENETIC MECHANISMS UNDERLYING ASSOCIATION BETWEEN SLEEP DISTURBANCES AND DEPRESSIVE SYMPTOMS

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Introduction: Although associations between insomnia and major depression disorder have been reported, little is known about the shared genetic mechanisms underlying their comorbidity. Polygenic scores (PGS) for sleep disturbances and depressive symptoms in an epidemiological cohort were calculated and correlated. Genes assigned to variants that compose the best-fit PGS predictions were overlapped to explore the shared genetic bases of sleep problems and depressive symptoms.
Methods: Human OmniExpress BeadChip genotyping was performed on the São Paulo Epidemiologic Sleep Study (EPISONO, N=1042), an adult epidemiological sample subjected to a sleep-based survey. PGS analysis was performed on 900 individuals with PRSice2. Summary statistics from a genome wide association study (GWAS) for depression (N=500,199, United Kingdom Biobank (UKBB) and Psychiatry Genetics Consortium) grounded the PGS calculations for Beck Depression Index (BDI), while insomnia GWAS (N=386,988, UKBB) based the PGS for Insomnia Severity Index (ISI) and Pittsburg Sleep Quality Index (PSQI) in EPISONO. Pearson's correlation was applied to contrast PGS and clinical scores. Genes were assigned to SNPs using Ensembl Variant Effect Predictor and Fisher's Exact test was used to test the overlap between gene lists. Pathway enrichment analysis was performed on sets of interest genes using Benjamin-Hochberg test.
Results: All PGS models were significant when individuals were divided as cases or controls according to BDI, PSQI and ISI scales. When clinical scales were used as continuous variables, the best-fit PGS models for BDI (p=0.0004, R2=1.56%) and PSQI scores (p=0.0058, R2=0.87%) reached statistical significance, but PGS calculations were unable to significantly predict ISI scores. PSQI and BDI scores were highly correlated, and the same observation was applied to PGS for sleep quality and depressive symptoms. Genes associated with the variants which compose the best-fit PGS predictions for sleep quality and depressive symptoms were significantly overlapped. Pathways enriched among the intersect genes are related to synapse function and formation.
Conclusion: The genetic bases of sleep quality and depressive symptoms are correlated; their implicated genes are significantly overlapped and converge on neural pathways. This data suggests that sleep complaints accompanying depressive symptoms are not secondary issues, but part of the core mental illness.
Support (if any): AFIP, FAPESP, CNPq.

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0032

METABOLOMIC PROFILE OF EXCESSIVE DAYTIME SLEEPINESS IN THE HISPANIC COMMUNITY HEALTH STUDY/STUDY OF LATINOS

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Introduction: Excessive daytime sleepiness (EDS) is a prevalent condition estimated to affect up to 33% of the United States population. EDS is a heterogeneous and complex symptom of various sleep disorders, insufficient sleep, and other chronic conditions and medications. EDS has also been associated with increased risk of cardiovascular and neuropsychiatric diseases, potentially through bidirectional causal pathways. In this study, we used metabolomic measurements in 6071 individuals from

the Hispanic Community Health Study/Study of Latinos to elucidate the metabolomic factors associated with EDS.
Methods: EDS was assessed using the Epworth Sleepiness Score (a 24-point scale) at baseline (2008), continuously modeled. Metabolomics (877 metabolites) were quantified using the Metabolon platform—from blood assayed at baseline—and were log scaled. Our primary and sex stratified models adjusted for age, body mass index, ethnicity, recruitment center, alcohol, smoking, and physical activity. Secondary analysis further adjusted for insomnia, sleep duration, and sleep apnea. Significance threshold was set to 0.00013 to account for multiple testing. Finally, the interplay between metabolites, pathways, and genes was investigated through network and pathway enrichment analyses.
Results: Levels of seven metabolite were each associated with a decrease of the sleepiness score by approximately 0.4 points per one log unit increase in metabolite levels. Those metabolites were primarily categorized as fatty acids (Eicosadienoic acid, Docosadienoate), steroids (Pregnenolone sulphate, Tetrahydrocortisol-glucuronide), along with a sphingomyelin and two uncharacterized metabolites. Sex stratified analysis identified three additional metabolites associated with EDS in men: Tyramine O-sulfate and two phosphatidylcholines. Tyramine O-sulfate was particularly associated with an increased sleepiness score by 0.5 per log unit; with attenuation after adjusting for sleep traits. Network and pathway enrichment analysis indicated that changes in pathways related to cortisol metabolism, hormonal steroid metabolism, and melatonin metabolism were linked to EDS.
Conclusion: These results suggest that a combination of metabolomic factors, representing diet and steroid hormonal pathways dietary related metabolites, and some genetic factors contributes to the metabolic profile of EDS. Some associations appeared independent of common sleep disorders while a male-specific association was driven by sleep disturbances (insomnia).
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0033

PROTEOMIC PROFILING OF PLASMA BIOMARKERS IN MEN AND WOMEN WITH DIAGNOSED INSOMNIA

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Introduction: Chronic insomnia disorder affects approximately 10% of the U.S. population and is linked to various adverse health consequences. Despite advancements in pharmacological interventions, many individuals continue to experience recurrent symptoms. A comprehensive understanding of the molecular mechanisms underlying insomnia is crucial for developing innovative and effective treatments. This study aimed to profile plasma proteins using an unbiased high-throughput assay to identify potential biomarkers for insomnia, with a specific focus on discerning any differential responses between men and women.
Methods: This prospective, observational study (n=60; 40 insomnia, 20 control; 58.3% females) was part of a larger study completed at Joint Base San Antonio-Lackland. Participants completed an overnight in-lab diagnostic polysomnogram, blood collection and clinical evaluation. We applied an unbiased high multiplexed proteomic discovery technique using DNA aptamers to target 7,000 proteins in plasma samples. Chi-square test and Mann–Whitney U-test were performed to determine the group differences. Adjusted p-values were calculated by using Benjamini–Hochberg's false discovery rate (FDR). Dysregulated proteins were uploaded into the Ingenuity Pathway Analysis software (Qiagen IPA) to explore the mechanistic networks most significantly associated with the study outcome. Significance level was set at 0.05 in all tests.
Results: We identified 54 significantly dysregulated plasma proteins (29 upregulated, 25 downregulated) when comparing individuals with diagnosed insomnia, stratified by gender. The top three upregulated proteins were T cell surface antigen CD2, Leptin (LEP), and N-terminal pro-BNP (NPPB); the top three downregulated proteins were Kunitz-type protease inhibitor 3 (SPINT3), Beta-defensin 104 (DEFB104A), and Benign Prostate-specific Antigen (KLK3). Pathway analysis revealed associations with proinflammatory cascades and metabolic signaling pathways.
Conclusion: Our findings highlight the feasibility of multiplex proteomic profiling in identifying blood-based biomarkers for understanding the pathophysiological mechanisms of insomnia disorder. Further research is warranted to ascertain the clinical utility of these candidate proteins.
Support (if any): This research was supported by grants from the American Academy of Sleep Medicine Foundation (supported by Eisai, Inc.), the Defense Health Agency, Defense Medical Research and Development Program, Clinical Research Intramural Initiative for Military Women's Health (DM170708; Mysliwiec), and the US Air Force Air Force Materiel Command (AFMC), Wright-Patterson Air Force Base, Ohio (FA8650-18-2-6953; Peterson).

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0034

SLEEP IS ASSOCIATED WITH TELOMERE SHORTENING: A POPULATION-BASED LONGITUDINAL STUDY

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Introduction: Evidence has shown that as the chronological age of an organism increases, there is a decrease in the telomere length (TL) via oxidative stress and inflammation pathways. Epidemiological studies have measured this parameter as the mean leukocyte TL and several associations between TL and age-related diseases have been described. Since the major pathophysiological factors related to inadequate sleep (including sleep complaints and sleep disorders) contribute to the exacerbation of inflammation and oxidative stress, the association of sleep and TL has been proposed in many cross-sectional studies. Thus, the aim of this study was to evaluate the association between sleep-related variables with TL in a population-based longitudinal framework.
Methods: We used data derived from the São Paulo Epidemiologic Sleep Study cohort, which was followed over 8 years. All individuals

answered sleep-related questionnaires, underwent a full-night polysomnography (PSG) and had their blood collected for DNA extraction. TL was measured through quantitative real time polymerase chain reaction. For analysis in a single point in time, the Generalized Linear Model was used. The Generalized Estimating Equations test was applied for the comparison between baseline and follow-up, considering age, sex and body mass index (BMI) as covariables; and Spearman correlations were applied to compare the delta values between baseline and follow-up.
Results: Of the 1,042 individuals in the EPISONO cohort, 68.3% accepted to participate in the follow-up study (n=712). We have found that baseline SpO2 (ß=0.007, p=0.013), medium SpO2 (ß=0.009, p=0.004) and total sleep time < 90% (ß=-0.142, p=0.037) had an effect on TL from the follow-up. The 8-year TL attrition was inversely associated with sleep quality, sleepiness, total sleep time, sleep efficiency, sleep architecture variables, wake after sleep onset, arousal index, oxygen-related variables baseline and the presence of obstructive sleep apnea (OSA).
Conclusion: Individuals with worse sleep quality, alterations in sleep architecture and OSA had greater TL attrition over the 8 years. Using a longitudinal approach, these findings confirm previous cross-sectional evidence linking sleep with accelerated biological aging.
Support (if any): This work was supported by grants from AFIP, CNPq and FAPESP.

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0035
CHARACTERIZATION OF METABOLITES IN A RANDOMIZED, CONTROLLED TRIAL OF CLARITHROMYCIN FOR PATHOLOGICAL SLEEPINESS

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Introduction: Pathologic sleepiness in CDH is associated with the presence of an endogenous, cerebrospinal fluid peptide that can positively, allosterically modulate GABA-A receptors. The macrolide antibiotic clarithromycin has been shown to benefit patients with hypersomnolence that is refractory to standard of care agents and is a negative allosteric modulator of GABA-A receptors. One explanation of its wake-promoting effects is the alteration of gastrointestinal microbiota composition. Here we characterize the metabolomics of serum and stool samples collected as part of a randomized, controlled trial of clarithromycin.
Methods: Ten patients and 10 Healthy controls had serum and stool samples taken on baseline study day and after a 2 week trial of clarithromycin dosed at 500mg bid, A total of 60 serum and stool samples were analyzed using Mass Spectrometry with a metabolomics panel. A total of 214 metabolites were detected, 122 in serum and 148 in stool with 56 overlapping metabolites.
Results: Samples were normalized by QC samples, log transformed and scaled separately for serum and stool. When comparing the 3 groups at the metabolite level, univariate analyses revealed 7 in serum and 4 in stool that had different levels between at nominal significance (p< 0.05). The 4 in stool were 2-Deoxyadenosine, 3-Hydroxybenzaldehyde, Imidazole acetic acid and N-Acetyl aspartate. The first 2 were driven by lower values in the Treatment group vs Healthy Controls, and the latter 2 were the opposite. The 7 in serum were (R)-2,3-Dihydroxy-isovalerate, Homoserine, L-Allothreonine, L-Threonine, O-Acetyl-L-Serine, Palmitoyl carnitine, Riboflavin. Paired log2 fold-change analysis in serum between treatment and baseline revealed nominally significant decrease in the expression of Theobromine (P=0.4). In stool, the analysis revealed changes in 3-Hydroxybutyric acid, 2-Deoxyadenosine,3-2-Hydroxyethylindole,3-Hydroxy-2-Methylpyridine, Glycerol 2-phosphate, N-Acetylaspartate, Nicotinic Acid, Mononucleotide, Riboflavin, and Theobromine. PCA loadings of serum and stool samples, overall and in each group, revealed the first 2 PC's consisting of 3-Hydroxybutyric acid and (R)-2,3-Dihydroxy-isovalerate
Conclusion: Despite similar profiles in serum and stool in patients, before and after treatment and healthy controls; subtle differences in particular metabolites may need to be further studied. Alternative pathways not currently captured in metabolomics in this study may be better suited to capture evidence of alternative mechanisms of clarithromycin efficacy.
Support (if any): NS111280

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0036
EXPLORING COMMON GENETIC FACTORS BETWEEN OBSTRUCTIVE SLEEP APNEA AND ASTHMA: INSIGHTS INTO INFLAMMATORY PATHWAYS

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Introduction: Obstructive sleep apnea (OSA) and asthma are globally prevalent respiratory disorders that share risk factors, symptoms and pathophysiological mechanisms. Emerging evidence suggests a bidirectional relationship, with each condition having a negative impact on the clinical course of the other. Although both diseases have a strong hereditary component, research assessing the genetic basis of their co-occurrence remains limited. Thus, the aim of this study was to analyze the interaction of risk genes and common biological pathways between OSA and asthma.
Methods: Two sets of genes associated with OSA (2,159 genes) and asthma (786 genes) were manually curated from significant single nucleotide polymorphisms (SNP) revealed in genome-wide association studies (GWAS). These lists were subsequently compared to identify intersecting genes, and the statistical significance of the overlap was assessed using Fisher's Exact Test. Pathway enrichment analysis was conducted utilizing the Benjamini-Hochberg test with a significance threshold set at an adjusted p-value< 0.05.
Results: There were 187 overlapping genes between OSA and asthma gene sets, indicating a significantly higher occurrence than expected by chance (p< 1.07E–29; odds ratio=2.3). The pathway overrepresentation analysis of these intersecting genes identified processes associated with immune system functions, encompassing human leucocyte antigen (HLA), antigen presentation, T cell differentiation, cell signaling, and positive regulation of inflammatory mediators.
Conclusion: The shared genetic basis between OSA and asthma suggests dysregulation of the immune response and pro-inflammatory processes as underlying pathophysiological mechanisms contributing to the susceptibility and manifestation of these comorbid conditions.
Support (if any): Associação Fundo de Incentivo à Pesquisa (AFIP); Fundação de Amparo à Pesquisa do Estado de São Paulo (FAPESP), and Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq).

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0037

INVESTIGATING COMMON GENETIC FACTORS BETWEEN OBSTRUCTIVE SLEEP APNEA AND PROSTATE CANCER

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Introduction: Cancer is one of the leading causes of death in the world. Studies have highlighted the possible association between obstructive sleep apnea (OSA) and an increased risk of incidence or prevalence of some types of cancer, especially prostate cancer. However, the extent to which genes that are related to both conditions contribute to their comorbidity is still unclear. The aim of this study was to evaluate the intersection of risk genes found in both OSA and prostate cancer.
Methods: Two sets of genes associated respectively with OSA and prostate cancer were manually curated and then compared to obtain an intersection gene list. Fisher's exact test was employed to evaluate the statistical significance of the overlap, with a significance threshold of p-value< 0.05. The identification of enriched pathways among the intersection gene list was performed using the Benjamini–Hochberg test, with a significance threshold of adjusted p-value< 0.05. A functional network was generated from the intersect gene list which was used as an input in a protein–protein interaction analysis conducted using the String database.
Results: Sixty-eight genes overlapped between prostate cancer risk genes and OSA-associated genes, indicating more overlap than expected by chance (odds ratio=2.665; p=2.606E–10). This intersect list was associated mainly with hypoxia, apoptosis, oxidative stress, and cell cycle, proliferation, or cell damage. The hypoxia-inducible factor (HIF)-1 signaling pathway stands out from the list of enriched pathways reported in both conditions (adjusted p-value< 0.0006). A 17-node network was retrieved from the overlapping gene list and included key proteins from the aforementioned enriched pathways, which comprised TNF, STAT3, BCL-2, TGF, and ATM.
Conclusion: The genetic basis of prostate cancer and OSA was significantly shared, indicating common molecular etiology in respect of this comorbidity. Relevant proliferation, apoptosis, and hypoxia pathways were significantly enriched among the genes associated with both conditions, suggesting their role in pathophysiological processes.
Support (if any): Associação Fundo de Incentivo à Pesquisa (AFIP); Fundação de Amparo à Pesquisa do Estado de São Paulo (FAPESP), and Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq).

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0038

KINESIN BINDING AS A SHARED PATHWAY UNDERLYING THE GENETIC BASIS OF MALE INFERTILITY AND INSOMNIA

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Introduction: Fertility problems are becoming increasingly common, with issues relating to men accounting for half of the cases. In addition to all the known causes of male infertility, some complaints are of idiopathic origin, and lifestyle, including sleep habits, might be an important underlying factor. Sleep disorders such as insomnia, which are prevalent in the population, might interfere in male fertility. Therefore, we aimed to perform an in silico study to test whether male infertility and insomnia share genetic risk variants, and to identify any molecular, cellular, and biological interactions between them.
Methods: Two lists of gene sets were manually curated through a literature review using PUBMED, 1 associated with male infertility (454 genes) and the other with insomnia (921 genes). The statistical significance of the gene list overlap was performed by the Fisher Exact test using Nematode Bioinformatics and Molbiotools online tools. This analysis considered a total of 21,196 genes in the human genome with a statistical threshold of P-value< 0.05. The enriched terms over-represented in the intersect gene list were acquired from the Benjamini-Hochberg and the protein-protein interaction (PPI) analysis was performed via String database.
Results: Among these genes, 28 were common for both lists, representing more overlap than expected by chance (Fisher's exact test, p-value=0.041). The biological function of the genes contained in the intersection gene list suggested that pathways related to kinesin binding were commonly found in both conditions (p-value=0.038). A protein-protein interaction (PPI) analysis using the intersection list as input retrieved 25 nodes and indicated that 2 of them were kinesin-related proteins (PLEKHM2 and KCL1).
Conclusion: One of the major physiological mechanisms supporting the crosstalk between the sperm and the neuron through kinesis-related processes is mitochondria recycling. The intersecting gene list and the enriched pathways retrieved from our analysis might reflect how the rhythm control of neural circuits may affect spermatogenesis and male fertility. These results might serve as preliminary findings for future clinical trials focused on the identification of pharmacological interventions tailored to this comorbidity.
Support (if any): AFIP, FAPESP, CNPq.

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0039

AN APPLE A DAY KEEPS BAD SLEEP AWAY? CAROTENOID CONSUMPTION AND MULTIMODAL SLEEP OUTCOMES IN ADOLESCENTS

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Introduction: Carotenoid consumption has been linked with greater likelihood of appropriate sleep duration and higher levels of sleep quality in adults. As only 2-7% of American adolescents met recommended fruit and vegetable intake guidelines in 2017, and over 70% of high schoolers regularly sleep less than 8 hours per night, adolescents may be especially influenced by relationships between poor diet and poor sleep. Previous studies in this area have been limited to other age groups or examination of singular sleep constructs.
Methods: Seventy-four adolescents (14-18 years; 43 female) completed 2-3 ASA-24 dietary recalls across randomized weekend and weekdays. They also completed the Pittsburgh Sleep Quality Index (PSQI), the Epworth Sleepiness Scale for Children and Adolescents (ESS-CHAD), and a Dim-Light Melatonin Onset (DLMO) appointment. Bivariate regressions examined

potential associations between average carotenoid consumption (α Carotene, β Carotene, β Cryptoxanthin, Lycopene, Leutin + Zeaxanthin) and self-reported sleep duration (PSQI Item 4), daytime sleepiness (ESS-CHAD Total) and melatonin onset time (DLMO, threshold 4 pg/mL). Subject age and sex were controlled for within each model. To correct for multiple comparisons, p was set to a significance threshold of 0.01 for predictors within the model and 0.05 for the entire model.

Results: Results: β Cryptoxanthin was a significant predictor of daytime sleepiness (beta=-.024, t(72)=-2.682, p=.009) and explained significant variance in the comprehensive model for this outcome (R2 = .072, F(3, 69)=2.901, p=.041). No other carotenoids emerged as significant predictors of sleep outcomes after correction for multiple comparisons. β Carotene neared significance for predicting duration (beta=-.258 , t(72)=-2.22, p=.030; R2 = .033, F(3, 69)=1.829, p=.15), as did Lycopene (beta=.243 , t(72)=2.086, p=.041; R2 = .026, F(3, 69)=1.632, p=.19).

Conclusion: β Cryptoxanthin could be investigated as a potential influence on daytime sleepiness in this age group. Further studies are needed to establish causality and to examine the clinical significance of consumption increases in this age group. Underconsumption of whole foods common to this developmental period may make it difficult to detect the effects of adequate or increased intake cross-sectionally.

Support (if any):

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0040

METABOLIC EFFECTS OF SUPERIMPOSED SUSTAINED AND INTERMITTENT HYPOXIA IN HEPATOCYTE-DERIVED SPHEROIDS

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Introduction: Chronic obstructive pulmonary disease/obstructive sleep apnea (COPD/OSA) overlap syndrome is characterized by chronic sustained hypoxemia due to COPD and superimposed intermittent hypoxemia due to OSA, and is associated with poor clinical outcomes related to the severity of hypoxemia. Overlap hypoxia (OH) combining sustained hypoxia and intermittent hypoxia (IH) causes an elevation in serum LDL cholesterol (LDL-C) and hepatic malondialdehyde, a marker of oxidative stress. The use of liver organoids (spheroids) cultured in hypoxia preserves liver-specific variability in tissue oxygenation. We aimed to determine how malondialdehyde and LDL-C uptake were impacted by OH in liver spheroids.

Methods: HepG2 cells were seeded into wells of round-bottom ultra-low attachment microplates to encourage spheroid formation. Media was changed 1:1 every other day for a total of 8 days. The spheroids were then pipetted into microplates with gas-permeable membranes. In a subset of wells, half the media was replaced by reconstituted LDL-DyLight 550, a conjugated human LDL-C which fluoresces upon endocytosis. Then, the spheroids were placed into one of three hypoxic environments using an OxyCycler C42 Dynamic O2 and CO2 controller: normoxia (16% O2 and 5% CO2), IH (O2 cycling between 16% and 2.5% every 3 min, constant 5% CO2), or OH (O2 cycling between 11.5% and 2.5% every 3 min, constant 5% CO2). After 4 hours, media and spheroids were collected for quantification of malondialdehyde (n=4 pooled samples/group), and spheroids with LDL-DyLight 550 were examined for fluorescence (n=24 spheroids/group).

Results: There were no morphologic differences among the groups after hypoxic or normoxic exposures. Malondialdehyde was increased in both hypoxic spheroid groups, though more in OH (RA: 2.9±1.4 μM; IH: 7.4±3.7 μM, p=0.005 vs RA; OH: 9.6±4.8 μM, p< 0.001 vs RA). LDL-C uptake was reduced by 28.4% in OH relative to RA (p=0.003). No effect was noted in IH (p=0.863).

Conclusion: Culture of hepatocyte-derived spheroids in hypoxic environments is feasible. OH in spheroid culture increases an important marker of oxidative stress, and reduces LDL-C uptake. These results echo previous animal-based data. Future experiments are intended to understand underlying mechanisms.

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0041

DRUG SCREENING AND CRISPR/CAS9 SCREENING OF HCN CHANNELS

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Introduction: A growing body of evidence suggests a role for HCN (hyperpolarization-activated cyclic nucleotide-gated) channels in regulation of sleep. We first tested effects of three HCN channel blockers (Corlanor, Zatebradine Hydrochloride and ZD7288) on sleep/wake behavior in wild type zebrafish compared to DMSO control. Then, to more definitively investigate roles of HCN channels, we knocked out genes encoding for HCN channel subunits in zebrafish by utilizing CRISPR/Cas9 technique and we assessed sleep/wake behavior in the HCN channel mutants.

Methods: The compounds were tested at six concentrations varying between 0.1-30 □M (.i.e., 0.1 μM, 0.3 μM, 1.0 μM, 4.5 μM, 10 μM and 30 μM) in zebrafish larvae in our drug screening study. Control groups were administered DMSO. In CRISPR screening, single cell-stage zebrafish embryos were injected with preformed ribonucleoprotein complexes containing Cas9 protein and two crRNAs targeting each homologous gene of human HCN1, HCN2, HCN3, and HCN4. Control groups were negative control crRNA injected embryos. Sleep phenotyping was performed by placing individual larva into the wells of 96 well plates and by recording their activity via commercially available video monitoring equipment.

Results: Drug screening study showed shorter latency to sleep at 0.1 μM dose of Ivabradine, moderate reductions in average activity at 30 μM dose of Zatebradine Hydrochloride, and increased sleep at 4.5 μM dose of ZD7288. Our CRISPR/Cas9 screening resulted in decreased activity in hcn1 crispants, fewer sleep bouts in daytime in hcn2 crispants, and no difference in sleep parameters in hcn3 crispants. hcn4 crispants had shorter sleep in both day and nighttime, hyperactivity and shorter sleep bouts at night and fewer sleep bouts in daytime.

Conclusion: Blocking HCN channels decreased wakefulness in our drug screening study. Genetically targeting hcn1 and hcn2 genes resulted in the same direction with the results of drug

screening study and knocking out hcn3 didn't change sleep parameters. Change in sleep parameters were in the opposite direction in hcn4 crispants. HCN channel blockers might be selecting HCN1 and HCN2 however further work is required to confirm this suggestion.
Support (if any):

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0042

MELANOPSIN CRISPANTS IN ZEBRAFISH DISPLAY DIFFERENCE IN SLEEP LATENCY

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Introduction: Melanopsin (OPN4) is a blue light sensitive opsin type G protein couple receptor. It is highly expressed in the photsenstive ganglion cells which mediate responses to light including regulation of sleep, circadian photoentrainment and pupillary light responses. Mutations in OPN4 were shown to affect responses to light ultimately affecting the regulation of circadian rhythms and sleep patterns. Sleep homeostasis was altered in homozygous knockout of Opn4, gene encoding for melanopsin, in mice. Human melanopsin variants which alter function significantly may contribute to sleep disturbance, circadian dysfunction and visual impairment. In order to further dissect the role of melanopsin in sleep in a diurnal vertebrate model, we created an F0 knockout model of opn4 gene in zebrafish and assessed sleep/wake phenotype.
Methods: In CRISPR/Cas9 screening, single cell-stage zebrafish embryos were injected with injection cocktail containing Cas9 protein and crRNAs targeting opn4a and opn4b, homologous genes of human OPN4. Control groups were negative control crRNA injected embryos. Zebrafish larvae were individually pipetted into each well of a 96 well plate. Larval zebrafish were raised on a 14 hour/10 hour light/dark cycle at 28.5□C until sleep phenotyping starts. Sleep phenotyping was carried out between days 5-8 post injection.
Results: Longer sleep latency at night was observed in opn4 CRISPR knockout larvae. This is in line with prior literature. Additional tests by exposing opn4 crispants and control zebrafish larvae to white light and dark pulses at different times were performed however the activity and sleep latency did not change across groups.
Conclusion: Sleep/wake phenotyping of opn4 (melanopsin) crispants in zebrafish displayed significant difference in sleep latency parameter compared to controls. Although additional tests carried out using pulses of white light need to be repeated, current results highlight the importance of OPN4 mediated pathways in affecting sleep latency.
Support (if any):

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0043

THE ROLE OF MEDIAN PREOPTIC NUCLEUS ASTROCYTES IN MEDIATING E2'S EFFECTS ON SLEEP-WAKE BEHAVIOR

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Introduction: Although 50-70 million Americans suffer from sleep disorders, women are 2x as likely as men to experience sleep disruptions. This discrepancy emerges at puberty and is strongly associated with fluctuations in estrogen, suggesting a role for estrogens in sleep disorders. Our previous work has identified the median preoptic nucleus (MnPO) as a key site regulating estradiol (E2) effects on sleep-wake behavior. We have also shown that E2 increases extracellular adenosine in the MnPO. Astrocytes are a major source of adenosine in the central nervous system, and cortical astrocytes have been shown to regulate sleep homeostasis. Thus, we hypothesize that MnPO astrocytes play a key role in the estrogenic mechanisms regulating sleep-wake behaviors.
Methods: To clarify the role of astrocytes in E2- modulation of sleep, we expressed Gi- or Gq-DREADDs in MnPO astrocytes of ovariectomized rats. Rats were treated with subcutaneous Oil injections (baseline) followed by injections of low (5ug) and high (10ug) dose E2, 24 hours apart. Rats also received Vehicle or Clozapine-N-oxide (CNO; 1.7mg/kg) at the time of their Oil/E2 injections. EEG/EMG recordings were acquired throughout treatment. To inhibit Ca2+signaling, and, ultimately, gliotransmission in astrocytes, we used a viral approach to express Pleckstrin Homology domain of Phospholipase C (PLC)-like protein p130 (p130PH) in MnPO astrocytes. p130PH is an IP3 buffer that prevents IP3 from initiating intracellular Ca2+ release and was previously shown to reduce astrocytic Ca2+signaling and gliotransmission (PMID: 20736051). Experimental (p130PH) and Control (tdTomato) animals were then treated with the Oil/E2 paradigm described above.
Results: In Oil-treated animals, CNO activation of Gq-DREADD increased wake and decreased sleep, mimicking E2's effects on Sleep-Wake behavior. Unexpectedly, CNO activation of Gi-DREADD produced similar effects, increasing wake and decreasing sleep. These observations may support literature findings that Gi-DREADDs, while inhibitory in neurons, may enhance activity in astrocytes. Thus, Gi-DREADDs may not be an ideal candidate for inhibiting astrocytic activity. Animals expressing p130PH (n=3) exhibited less wake and more NREM sleep than animals injected with Control virus (n=3).
Conclusion: These preliminary findings suggest that E2 may increase wake by enhancing activity of MnPO astrocytes and highlight a need for further investigation.
Support (if any):

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0044

SLEEP NEED-DEPENDENT PLASTICITY OF A THALAMIC CIRCUIT GENERATES PERSISTENCE OF SLEEP DRIVE

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Introduction: Prolonged wakefulness leads to persistent, deep recovery sleep. However, the neuronal circuits mediating this process remain elusive. Here, starting from a large circuit screen, we identify and characterize a group of thalamic nucleus reuniens (RE) neurons activated by sleep pressure and required for sleep homeostasis.
Methods: To identify upstream excitatory neuronal populations inducing NREM sleep, we performed rabies virus-mediated screening in mice. Sleep/wake states were assayed using tethered EEG/EMG recordings. Activation or inhibition of neuronal activity was performed using chemogenetic and/or optogenetic techniques. Behavior during optogenetic RE activation was assessed using video recordings. To genetically access the sleep pressure-activated RE neurons, Targeted Recombination in Active Populations (TRAP2) mice were used. Viral expression of caspase3 was used for selective ablation of cells. For projection analyses, virally expressed Synaptophysin was used as a presynaptic marker. To visually examine synaptic connectivity, we performed enhanced Green fluorescent protein Reconstruction Across Synaptic Partners (eGRASP) analysis. Functional connectivity between RE to downstream neurons was tested by slice patch-clamp recordings.
Results: From a circuit screen in mice, we identified a group of excitatory thalamic RE neurons activated by sleep pressure and required for sleep homeostasis. Optogenetic activation of these neurons leads to an unusual phenotype: sleep-preparatory behaviors (e.g., nesting) followed by prolonged, intense sleep resembling recovery sleep. The activity of RE neurons (assessed by Fos) is increased by sleep deprivation (SD), and ablation of these Fos+ RE cells markedly impairs recovery sleep following SD. Moreover, inhibiting RE activity during SD impairs subsequent recovery sleep, suggesting that these neurons signal sleep need. RE neurons act upstream of sleep-promoting zona incerta (ZI) cells, and, remarkably, SD triggers plasticity of this circuit to strengthen its connectivity, as assessed by eGRASP analysis and patch-clamp recordings. Finally, our results indicate that CaMKII signaling is required for morphological plasticity of the RE-ZI circuit and persistence of homeostatic NREM sleep.
Conclusion: A subset of RE neurons encode sleep pressure and generate persistent NREM sleep, via a projection to sleep-promoting ZI neurons. Increased sleep need triggers plasticity of the RE-ZI projection which enhances functional connectivity facilitating the transmission of homeostatic sleep drive.
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0045

LATERAL HYPOTHALAMIC NEUROTENSIN NEURONS ARE NECESSARY FOR WAKE MAINTENANCE

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Introduction: The lateral Hypothalamic area (LH) has been established as a critical site for regulating wakefulness. However, the exact neural elements within this region that promote and stabilize wakefulness are not completely understood. While the orexin neurons in the LH are well-known, other subpopulations within this area may also contribute to arousal control.

In this regard, we have recently identified a subset of LH neurons expressing neurotensin (Nts) promoting wakefulness. Optogenetic activation of LH-Nts neurons rapidly induces arousal from non-rapid eye movement (NREM) sleep, while chemoactivation induces up to five hours of uninterrupted wakefulness. However, the precise role of these neurons in initiating and maintaining spontaneous wakefulness remains unknown. To address this question, we investigated 1) the activity dynamics of LH-Nts neurons across sleep-wake behavior and 2) the impact of their ablation on sleep-wake amounts and architecture.
Methods: Experiment 1 – LH-Nts neuron activity dynamics: Nts-Cre mice (expressing Cre recombinase specifically in Nts neurons) were injected with an adeno-associated viral (AAV) vector coding for a Cre-dependent GCaMPS (genetically encoded calcium sensors) into the LH. They were also implanted with optical fibers targeting 50μm above the injection site and EEG/EMG electrodes to assess sleep-wake. After three weeks, fiber photometry with concurrent sleep-wake recordings was performed for two hours during the light period in all mice. Experiment 2 – sleep-wake effects of LH-Nts neuron ablation: Nts-Cre mice were injected with an AAV coding for diphtheria toxin-A subunit (AAV-flex-DTA) or a control AAV coding for a red fluorescent protein (AAV-flex-mCherry) into the LH and were implanted with transmitters for the telemetric recording of EEG/EMG. Sleep-wake recordings were performed 24 hours at four weeks after surgery. All mice were then perfused, and injection/lesion sites were verified histologically.
Results: LH-Nts neurons were more active during Wakefulness and REM sleep when compared to NREM sleep. The loss of these neurons reduced the total amounts of Wake and the average duration of Wake bouts but increased the 0.5-4 Hz delta power in Wake EEG.
Conclusion: LH-Nts neurons are necessary for maintaining spontaneous wakefulness, and their loss leads to chronic sleepiness in mice.
Support (if any): NIH R01-NS119223 (to R.V)

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0046

A MECHANISM BY WHICH ESTRADIOL (E2) REGULATES ADENOSINERGIC SIGNALING IN THE MEDIAN PREOPTIC NUCLEUS (MNPO)

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Introduction: Women report more sleep difficulties than men, particularly during times of hormonal fluctuations. This indicates that sex hormones likely play a role in a woman's sleep-wake cycle, but the mechanism by which they do so is largely unknown. We have previously shown that estradiol (E2) increases wake and decreases NREM sleep in female rats, and that E2 action in the median preoptic nucleus (MnPO), a major sleep center in the brain, is necessary and sufficient to induce wakefulness. Additionally, in the MnPO, E2 increases extracellular adenosine, which is known to induce NREM sleep via activation of the A2A adenosine receptor (A2AR). Our previous work demonstrated that an A2AR agonist infused in the MnPO is not able to mediate its pro-sleep effects in the presence of E2, and the current work investigates a mechanism for this finding. Our preliminary data shows that E2 upregulates the mRNA of an orphan receptor, GPR37, in the MnPO; GPR37 has been shown to form heteromers with A2AR and reduce the expression and function of A2AR in the striatum. We hypothesize that E2-induced upregulation of GPR37 leads to inhibition of A2AR in the MnPO, thus preventing its pro-sleep effects.
Methods: To examine mRNA and protein expression, ovariectomized female rats were treated with subcutaneous injections of E2 or oil for two days and sacrificed on the third day, where their brains were collected. To examine if GPR37 knockdown in the MnPO affects E2's ability to induce wakefulness, a GPR37 shRNA virus or scramble virus control was injected into the MnPO of female rats; they were also ovariectomized and had telemeters implanted to measure sleep-wake states in the presence of oil and E2.
Results: We found that E2 increases GPR37 mRNA and protein expression while decreasing A2AR mRNA expression in the MnPO. Furthermore, we found that knockdown of GPR37 in the MnPO significantly attenuates the effects of E2 on wakefulness, NREM sleep, and REM sleep in the dark phase but not the light phase.
Conclusion: E2 appears to have an effect on the sleep/wake phenotype through adenosinergic signaling and expression in the MnPO through E2-induced upregulation of GPR37.
Support (if any):

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0047

INTRACRANIAL EEG REVEALS HUMAN CEREBRAL CORTICAL REGIONS THAT ARE SPARED FROM ALPHA-DELTA SLEEP

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Introduction: Alpha-delta sleep, also known as alpha wave intrusion during sleep, is an electroencephalography (EEG) pattern often observed in clinical settings, and is associated with unrefreshing sleep and chronic fatigue or pain. The neural basis of alpha-delta sleep is poorly understood, and the extent of the cerebral cortex's involvement is unknown. Here we use overnight intracranial and scalp EEG in adult humans to explore the cortical neural mechanisms of alpha-delta sleep.
Methods: We studied neurosurgical epilepsy patients who underwent longitudinal intracranial EEG (iEEG) monitoring. In each patient, data were simultaneously recorded overnight from iEEG electrodes and electrodes placed on scalp for polysomnography. To focus on local neural activity, we derived each iEEG channel as the signal difference between two adjacent recording sites separated by 5 mm within the cerebral cortex. For each 30-second epoch, we calculated EEG power in delta (1-4 Hz), theta (4-8 Hz), and alpha (8-15 Hz) frequency bands for all iEEG channels, and for sleep-scoring scalp EEG channels (e.g. C3-A2). Other bands were studied to rule out the effects of sleep spindles. For each night (comprising around 1000 epochs), we calculated the Spearman's rank correlation coefficients of the EEG power values across epochs between the delta-band and the alpha-band power in each channel.
Results: All scalp EEG and most iEEG channels showed large increases of delta-band power during non-REM sleep compared to awake. Many (> 75%) of these channels also showed significant increases of alpha-band power, and positive correlations across overnight epochs between delta-band and alpha-band power, indicating involvement of alpha-delta sleep. However, a

minority (< 25%) of iEEG channels, often located in the temporal lobe, showed significant decreases of alpha-band power during non-REM sleep compared to awake, and negative correlations between delta-band and alpha-band power, therefore appearing to be not involved in alpha-delta sleep.
Conclusion: Our iEEG study showed for the first time that alpha-delta sleep is not homogeneous across the cerebral cortex. Instead, the cortical distribution of alpha waves is more spatially restricted than the distribution of delta waves during non-REM sleep. This finding sheds new light on the neural basis of alpha-delta sleep.
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0048

INVESTIGATING THE EFFECTS OF CONSECUTIVE NIGHTS OF PRE-SLEEP ALCOHOL USE ON SLEEP SPINDLE DENSITY AND DISTRIBUTION

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Introduction: We previously reported the impact of consecutive nights of alcohol on sleep macrostructure variables. Sleep spindle density and distribution, however, remain unexamined in response to alcohol. This report tests the hypothesis that sleep spindle density will be lower following pre-sleep alcohol and most affected early in the sleep period.
Methods: Thirty (15F; ages=22-57, mean=33) healthy adult participants took part in a crossover, within-subjects study with two 3-night in-lab conditions: a Mixer + Alcohol condition targeted a BrAC of 0.08 mg/L and a counter-balanced Mixer-only condition; conditions were separated by ≥ 3 days. All drinking ended 1 hour before lights out. Sleep EEG derivations C3-A2 and C4-A1 were submitted to a validated sleep spindle detection algorithm (Ferrarelli, et al., 2007). Sleep spindle density in NREM sleep (#/min; Stages 2-4) was averaged between channels and submitted to a series of linear mixed-effects models. A first, 2x3 model examined the factors beverage and night (Nights 1-3) on NREM spindle density. Next, data were stratified into thirds of the night, with the model repeated for each third.
Results: A main effect of alcohol on sleep spindle density across the whole night was identified ($F(1,145)=5.33$, $p=.022$). Sleep spindle density was lower on Mixer + Alcohol nights (1.6±0.7 spindles/min) vs Mixer-only (1.9±0.5 spindles/min). No effect of Night(1-3) or interaction of beverage and night was observed (p's>.05). Next, we identified opposing effects of alcohol on sleep spindle density in early vs. late sleep. In the first third of the night sleep spindle density was lower on Mixer + Alcohol nights (0.4±0.3 spindles/min) compared to Mixer-only (0.9 ± 0.3 spindles/min; $F(1,145)=8.33$, $p<.01$)). In the final third of the night, spindle density was conversely higher in the Mixer + Alcohol nights (2.9±1.1 spindles/min) compared to Mixer-only (2.1±0.8 spindles/min; $F(1,145)=4.1$, $p=.03$)). No other effects were identified (p's>.05).
Conclusion: Alcohol use prior to sleep resulted in reduced sleep spindle density early in the night and higher spindle density late in the night. No effects of consecutive nights were observed. These differences add to a growing discussion of the impact that alcohol has on sleep physiology across the night.
Support (if any): R01AA025593

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0049

SLEEP AND ELECTROENCEPHALOGRAM EFFECTS FROM A DUAL OREXIN RECEPTOR ANTAGONIST IN MICE WITH TRAUMATIC BRAIN INJURY

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Introduction: Traumatic brain injuries (TBI) can cause persistent sleep dysregulation regardless of injury severity including hypersomnia, hyposmia, sleepiness, sleep fragmentation, and altered electroencephalogram (EEG) power spectra. Most TBIs are mild in severity, occur in the frontal cortex, and sleep dysregulation can change over time. Orexin targets two receptors that stimulate monoamine release in the brain to promote wakefulness. Our goal was to determine if a dual orexin receptor antagonist (DORA) could improve sleep dysregulation in mice with TBI.
Methods: Two-month-old male and female C57BL/6J mice were randomly assigned to treatment groups. Mice underwent polysomnography surgery. After recovery, mice were administered vehicle by gavage then underwent baseline sleep recordings for 24 h followed by a multiple sleep latency test (MSLT). Mice received a craniectomy and mild/moderate TBI via controlled cortical impact or only a craniectomy serving as a control. A DORA or vehicle were given by gavage, and sleep and MSLT were recorded 24 h, 2 wks, 1 m, and 2 m post-TBI. Sleep state amounts and episode durations and frequencies, sleep latency, and EEG power spectra (0-40 Hz) were determined with significance set at $p< 0.05$.
Results: In mice given the DORA or vehicle, non-rapid-eye movement (NREM) sleep was significantly increased 24 h after TBI compared to controls. Conversely, NREM sleep was significantly reduced 2 m post-TBI in both vehicle and DORA groups. DORA and/or TBI groups had significantly reduced waking episodes 24 h post-injury but increased waking episodes 2 m post-TBI compared to controls indicating sleep fragmentation. Largely, significantly increased sleep latency time in the MSLT was found throughout all times post-injury in the DORA and TBI groups compared to the controls, which suggests increased sleepiness. Relative to controls, TBI significantly increased EEG delta power (0.5-4 Hz) 24 h post-TBI and significantly reduced EEG delta power 2 m post-TBI, although other frequency bands were not affected.
Conclusion: These data suggest that a DORA induces sleepiness but has minimal effects on impaired sleep amounts, sleep fragmentation, sleepiness, and EEG power spectra 2 m after mild/moderate TBI.
Support (if any): Merit Review Award (I01BX005379)(MRZ) and SPiRE Award (I21RX003722)(GBK) Department of Veterans Affairs

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0050

GLOSSOPHARYNGEAL NERVE DISCHARGE PATTERNS IN NEUROMUSCULAR CONTROL OF BREATHING

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Introduction: The glossopharyngeal nerve is important for gas exchange in fish, but in mammals concentration is focused on the hypoglossal nerve (Dewald et al, 2018). In the present study, we hypothesize the discharge pattern of glossopharyngeal nerve activity (GPNA) will relate to the 3-phase respiratory motor pattern apparent in the vagal, hypoglossal, and phrenic nerves in mammals.
Methods: We recorded GPNA from in situ arterially perfused brainstem preparations of juvenile rats (n=10) and compared these data to simultaneously recorded phrenic (PNA), vagal (VNA), and hypoglossal (HNA) nerve activities. We report the timing of GPNA relative to onset and duration of PNA, HNA, and VNA for at least 32 respiratory cycles in each preparation.
Results: Preparations had a eupnea-like 3-phase respiratory motor pattern (Dutschmann et al 2009). The average respiratory cycle length was 4.30s ± 0.61 (Mean±SD). The inspiratory discharge duration analyzed from PNA was 0.73s ± 0.15; the postinspiratory discharge duration analyzed from VNA, 2.85s ± 0.69; and a late expiratory phase duration, 0.87s ± 0.46. The GPNA started significantly before the onset of PNA with a pre-inspiratory discharge duration of 0.53s ± 0.23 (ANOVA p=0.0001). Overall the pre-inspiratory discharge of GPNA was similar compared to pre-inspiratory discharge of HNA (0.36s ± 0.21), postinspiratory discharge duration of GPNA (0.53s ± 0.12) was also comparable to HNA (0.59s ± 0.26), but significantly shorter compared to VNA (2.85s ± 0.69; p=0.0001).
Conclusion: Both GPNA and HNA displayed robust, characteristic pre-inspiratory/inspiratory discharge patterns in every preparation. Clinically, the activation pattern of the GPNA may be as crucial as that of the HNA, for maintaining a healthy, patent upper airway for breathing during sleep.
Support (if any): The Japanese Respiratory Society Fellowship Grants, NIH/NHLBI

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0051

THE MELANOCORTIN AND ENDORPHIN NEUROPEPTIDES IN PATIENTS WITH RESTLESS LEGS SYNDROME

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Introduction: Based upon similarities between the urge to move and sensory discomfort of restless legs syndrome (RLS) and properties of melanocortin hormones, like their incitement of movement and hyperalgesia, we assessed plasma and cerebrospinal fluid (CSF) α-melanocyte stimulating hormone (α-MSH) and β-endorphin in RLS patients and controls.
Methods: Forty-two untreated moderate-to-severe RLS patients and 44 matched controls underwent venipuncture at 19:00PM, 20:30PM, and 22:00PM; 37 RLS and 36 controls had lumbar puncture at 21:30PM. CSF and plasma were analyzed for pro-opiomelanocortin (POMC), adrenocorticotropin hormone (ACTH), α-MSH, β-MSH, and β-endorphin by immunoassay. RLS severity was assessed by International RLS Study Group Severity Scale.
Results: RLS participants were 52.7±12.0 years; 61.9% women; 21.4% painful RLS; RLS severity 24.8±9.0. Controls had similar age and sex. Plasma ACTH, α-MSH, and β-endorphin were similar between groups. Plasma POMC was significantly greater in RLS than controls (17.0±11.5 vs. 12.7±6.1 fmol/mL; p=0.048). CSF ACTH was similar between groups. CSF β-MSH was significantly higher in painful than non-painful RLS or controls (48.2±24.8 vs. 32.1±14.8 vs. 32.6±15.2 pg/mL; ANOVA p=0.03). CSF α-MSH was higher in RLS than controls (34.2±40.9 vs. 20.3±11.0 pg/mL; p=0.062). CSF β-EDP was lowest in painful RLS, intermediate in non-painful RLS, and highest in controls (8.0±3.4 vs. 10.8±3.1 vs. 12.3±5.0 pg/mL; ANOVA p=0.049). The ratio of the sum of CSF α- and β-MSH to CSF β-endorphin was highest, intermediate, and lowest in painful, non-painful RLS, and controls (p=0.007).
Conclusion: CSF α- and β-MSH are increased and CSF β-endorphin decreased in RLS patients, particularly for painful RLS.
Support (if any): This work was supported by a Department of Defense Discovery Award grant, part of the Peer Reviewed Medical Research Program and the Congressionally Directed Medical Research Program (CRMRP). The grant was entitled Restless Legs Syndrome and the Melanocortin System; grant number W81XWH2010003.

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0052

RECOVERY NAP AFTER TOTAL SLEEP DEPRIVATION RESTORES EMOTIONAL MEMORY PERFORMANCE TO TYPICALLY-RESTED LEVELS

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Introduction: While a brief period of recovery sleep can ameliorate the negative impacts of total sleep deprivation (TSD) on cognitive functioning, the effects of post-TSD recovery sleep on different forms of emotional functioning remain equivocal. Here, we investigated the effects of TSD and post-TSD recovery sleep on emotional memory processing and compared it to typical functioning in a rested condition.
Methods: During encoding of the emotional memory trade-off (ETO) task, participants viewed scenes with negative or neutral central objects overlaid on neutral backgrounds. During recognition, the central objects and backgrounds were presented separately and participants were asked to identify each of them as 'Old' or 'New'. Forty-six participants in the TSD condition and 22 participants in the Sleep condition completed encoding the morning after the sleep manipulation (~10:00) and a recognition test was conducted on half of the scene components after a short delay (Recog_1, ~10:45). Twenty of the TSD participants were then given a 90-min nap opportunity (TSD_Nap). Participants then completed a second recognition test on the remaining images (Recog_2, ~14:00).
Results: At Recog_1, a group effect revealed significantly worse memory after TSD compared to Sleep ($p=.02$). Specifically, memory was significantly worse for every scene component except neutral objects, and there were no baseline differences between TSD_nap and TSD_NoNap participants. At Recog_2, memory continued to deteriorate for all scene components in the TSD_NoNap group compared to their Recog_1 performance (all p's< 0.025). The TSD_nap group, however, had no change in memory for any of the neutral scene components and had improved negative object memory ($p=.049$) driven by a reduced false alarm rate ($p<.001$). As such, performance in the TSD_nap group matched the Sleep group at Recog_2 (all p's>0.1).
Conclusion: These results demonstrate that post-TSD recovery sleep preserves and restores memory functioning such that performance matches typically-rested individuals – while extended TSD leads to continued deterioration – highlighting the importance of sleep in healthy emotional memory functioning. Additionally, the ETO effect (i.e., greater disparity between negative objects and their paired backgrounds compared to neutral objects and their backgrounds) was preserved for both recognition tasks in all groups, demonstrating the strength of this memory phenomenon.
Support (if any):

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0053

THE TEMPORAL DYNAMICS OF EMOTIONAL MEMORY AND REACTIVITY IN PATIENTS WITH INSOMNIA DISORDER

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Introduction: Insomnia is commonly linked with mood and anxiety-related disorders characterized by disrupted emotional memory processing. However, much remains unknown about the neurocognitive mechanisms underlying emotional memory processing among patients with insomnia. The current study seeks to examine the temporal dynamics of emotional memory processing among both patients with insomnia and healthy sleepers.
Methods: Thirty-four patients with DSM-5 insomnia disorder (23 females; Mage = 24.94) and 35 healthy sleepers (23 females; Mage = 23.91) encoded 48 pairs of pseudo-words and negative/neutral scene pictures in the evening, followed by overnight EEG-recorded sleep. All participants completed cued-recall memory tasks and affective ratings at pre-sleep, post-sleep, and 7-day delayed sessions.
Results: From the post-sleep to 7-day delayed sessions, patients with insomnia showed greater preservation of pictorial memory ($ps < 0.001$) and less dissipation of affective tone compared to the healthy sleepers ($ps < 0.016$). Moreover, among healthy sleepers, the product of post-encoding slow wave sleep (SWS) and rapid eye movement (REM) sleep duration predicted greater over-time negative memory decay ($b = -0.001$, $p = 0.035$), whereas REM duration predicted the dissipation of negative arousal ratings over time ($b = -0.03$, $p = 0.041$). Notably, these associations were not observed in the insomnia group.
Conclusion: These findings provide insight into the fundamental irregularities in emotional memory processing among patients with insomnia. For healthy sleepers, the results suggest a joint engagement of SWS and REM in promoting negative memory decay, and an adaptive role of REM sleep in facilitating the attenuation of affective arousal over time.
Support (if any):

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0054

PTSD SEVERITY MODERATES THE ASSOCIATION BETWEEN N3 NESTED SLEEP SPINDLES AND EMOTIONAL MEMORY

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Introduction: Sleep disturbance is a core feature of posttraumatic stress disorder (PTSD) and may contribute to aberrant emotional memory processing in the disorder. Sleep spindles during N3 sleep that overlap temporally with slow oscillations (nested N3 SO spindles) are thought to play a role in memory consolidation and may be one mechanism through which adaptive memory processes are disrupted in PTSD.
Methods: N = 44 trauma-exposed participants (Mean Age = 32.4 (SD = 6.0), 47.7% female, 86.4% veteran) with variable PTSD severity (Mean CAPS-5 = 15.5 (SD = 10.8)) based on clinician-administered PTSD Scale (CAPS-5) viewed emotional and neutral International Affective Picture Scale (IAPS) images during electroencephalography (EEG) recording. Neurophysiological reactivity in the 300-1000 msec following stimulus presentation (late positive potential (LPP)) was measured. Participants then

took a polysomnography (PSG) measured nap from which nested N3 SO spindle rates were derived. Participants' recall memory of images was assessed post nap. Linear regression was used to test for an interaction between CAPS score and LPP magnitude (emotional minus neutral) in predicting N3 SO spindle rate and to test for an interaction between CAPS score and N3 SO spindle rate in predicting emotional memory measures (emotional hit rate, false alarm rate, and d', controlling for neutral).
Results: Across subjects, the LPP was greater for emotional compared to neutral images ($p < 0.001$). Furthermore, the association between LPP magnitude and nested N3 SO spindles was moderated by CAPS severity ($p = 0.03$), such that participants with low CAPS evidenced a positive association between LPP reactivity and nested N3 SO spindle rate ($p = 0.048$) whereas high CAPS participants showed no association ($p = 0.26$). We additionally found that associations between nested N3 SO spindle rate and several measures of emotional memory were moderated by CAPS severity (ps < 0.05): higher nested N3 SO spindle rates were correlated with worse memory for emotional images in high CAPS participants (ps < 0.05), but improved memory in low CAPS participants (ps < 0.05).
Conclusion: Results suggest a breakdown in the function of nested N3 SO spindles for emotional memory consolidation in PTSD.
Support (if any): VA Career Development Award 5IK2CX000871-05 (PI Richards) .

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0055
LEPTIN MODERATES THE RELATIONSHIP BETWEEN SLEEP QUALITY AND MEMORY FUNCTION: A POPULATION-BASED STUDY

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Introduction: Sleep is crucial for memory, as it promotes its encoding, consolidation, storage, and retrieval. Sleep periods following learning enhance memory consolidation. Leptin, a hormone that regulates appetite and energy balance, also influences memory and neuroplasticity. It plays a neurotrophic role in the hippocampus, enhancing synaptic function and promoting memory processes. Given these associations between sleep, memory, and leptin, this study aimed to evaluate the interplay between sleep quality, memory complaints and leptin levels.
Methods: Using data from the São Paulo Epidemiologic Sleep Study (EPISONO) 2007 edition, we analyzed data from 881 participants who underwent evaluations for subjective sleep quality (Pittsburgh Sleep Quality Index), memory function (Prospective and Retrospective Memory Questionnaire), body mass index and plasmatic leptin levels. Linear regression explored variable relationships, and a mediation/moderation model assessed causal effects on sleep quality, memory, and leptin, with age as a covariate. Analyses were performed on all volunteers and separately by sleep quality, considering sex as a potential influence. The statistical software used was Jamovi version 2.3.24, with a significance level set at 5% ($p< 0.05$).
Results: After confirming that subjects with poor sleep quality had more memory complaints ($p< 0.001$) in our cohort, we observed that leptin levels were increased in individuals with more memory complaints ($p< 0.001$) but there was no association between leptin levels and sleep quality ($p=0.177$). Mediation analysis reinforced the direct effect of sleep quality on memory function, but leptin had no indirect effect as mediator over the sleep-memory association. Moderation analysis revealed that leptin acted as a moderator in the relationship between sleep quality and memory ($p< 0.001$), with increased leptin levels enhancing the effect of sleep quality over memory function.
Conclusion: Leptin, a hormone involved in appetite control and energy balance, acts as a moderator of the relationship between sleep quality and memory performance. Individuals with high leptin levels are more susceptible to the negative effects of poor sleep on memory. This finding highlights the complexity of the interaction between sleep, memory, and metabolic factors, such as leptin, and its potential implications for overall health and well-being.
Support (if any): AFIP, FAPESP, CNPq.

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0056
OVERNIGHT MEMORY CONSOLIDATION IN ADOLESCENTS: EFFECTS OF CHANGE IN DLMO PHASE AFTER SLEEP RESTRICTION

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Introduction: Sleep aids learning and memory. Limited studies have examined how circadian rhythms moderate this process, particularly in adolescents who experience developmental changes in circadian biology. Here we examine how sleep restriction, memory consolidation, and circadian biology interact in youth with distinct circadian phase preferences.
Methods: Adolescents were recruited based on circadian phase preference on the Morningness/Eveningness (M/E; Carskadon et al., 1993) scale. Sixteen participants entered the current analysis (6F, 2 Non-White; age 10-15, mean±sd:12.69±1.76 years; M/E 22-40; mean±sd: 33.38±5.78; 1 Evening-Type [M/E≤23]; 4 Neither Type [23>M/E< 34]; 11 Morning type]). All completed 19 nights of stabilization on a self-selected 9-hour in bed schedule followed by 7 nights of sleep restriction (6.5 hours in bed; bedtime delayed and rise time advanced equally). In-lab dim-light-melatonin-onset (DLMO) assessment occurred on the final nights of stabilization and restriction. Overnight memory consolidation was indexed on the motor sequence task (MST; Walker et al., 2006) across the final night of sleep restriction. Memory outcomes included speed (# correct sequences), # of errors, and precision (speed-error trade-off). We examined overnight improvement (morning-evening) in MST performance and associations between improvement, phase preference score, stabilized DLMO phase, and the DLMO phase change after restriction (negative numbers indicate phase delay). Regressions controlled for age where statistically justified.
Results: MST speed improved ($t(15)=-3.44$, $p<.01$, $d=0.86$) for the morning (12.94±6.89) test session compared to evening (10.81±5.69). There were no overnight changes in errors or precision (d's<.14, p's>.34). Overnight improvement was not related to M/E phase preference (Adj. R2's< 0.17; p's>.05); however, there was a significant association between the change in DLMO phase (mean±sd: 10.34±41.69 minutes) and memory consolidation for both speed (Adj. $R2=0.54$, $F(2,13)=9.79$, $p<.01$) and

errors (Adj. R2=0.21, F(1,15)=4.94, p<.05). Specifically, children with a greater delay in DLMO phase demonstrated greater overnight improvement on the MST.
Conclusion: These data indicate a potential link between circadian biology and the cognitive benefits of sleep during adolescence. These findings are significant given the shifts in circadian rhythms occurring across adolescence. Understanding the influence of circadian rhythms in sleep-dependent memory may inform discussions of how sleep loss affects learning in school-aged youth.
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0057
FUNCTIONAL NETWORK ARCHITECTURE SUPPORTS MEMORY CONSOLIDATION VIA NREM SLEEP OSCILLATION EXPRESSION AND COUPLING

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Introduction: Memory consolidation is facilitated by trace reactivation during non-rapid eye movement slow wave sleep (SWS), involving reinstatement of a hippocampal index driving integration of activity patterns stored in cortical modules. Slow oscillation (SO) and sleep spindle (SP) coupling reflects this process. Here, we used a novel graph theory approach to examine whether network modularity (Q) and the relative import of the hippocampus and amygdala in network function, measured by eigenvector centrality (EC) and betweenness centrality (BC), are associated with SWS expression, SO-SP coupling, and emotional memory consolidation.
Methods: Thirty-six cognitively intact older adults (μ=72.9±5.6 years, 23 Females) completed structural and resting-state functional magnetic resonance imaging (MRI) at 3T, an overnight polysomnography with electroencephalography, and, prior to and following sleep, performed the Emotional Mnemonic Discrimination Task, with the Lure Discrimination Index quantifying memory. MRI data were preprocessed with the CONN toolbox. Network nodes were defined using the Brainnetome atlas. Graph metrics were computed using the Brain Connectivity Toolbox. In a subset, p-welch derived SO power (N=18) and mean vector length computed phase-amplitude SO-SP coupling (N=16) were derived.
Results: Q was associated with diminished emotional memory retention (B=-1.394, p=0.042) and greater SWS percentage (B=48.476, p=0.023), which was also associated with emotional memory retention (B=0.013, p=0.020). An inconsistent mediation effect of SWS in the Q-emotional memory retention relationship was found (95% CIs: 0.015, 0.345). Hippocampal EC (B=36.845, p=0.008) and amygdala EC (B=47.277, p=0.022) were associated with emotional memory retention. Hippocampal BC was associated with immediate test performance (B=19.859, p=0.027), whereas amygdala BC was associated with delayed test (B=1.823, SE=0.745, p=0.020) and emotional memory retention (B=1.699, p=0.047). Hippocampal EC (B=0.475, p=0.047) and BC (B=0.426, p=0.086) were associated with frontal SO expression, which was associated with delayed test performance (B=0.492, p=0.038). Hippocampal EC (B=0.649, p=0.006) and amygdala BC (B=0.545, p=0.029) were associated with frontal SO-SP coupling.
Conclusion: These findings suggest that greater network integration supports SWS-dependent emotional memory consolidation during sleep. A more topologically influential hippocampus aids in memory acquisition and retention, whereas a more influential amygdala supports emotional memory consolidation.
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0058
NEURAL DIFFERENTIATION OF COMPETING MEMORY REPRESENTATIONS AFTER A PREDICTION ERROR DEPENDS ON REM SLEEP

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Introduction: When we retrieve a memory, competing memories can come to mind. One way the brain might resolve this competition is by pushing the interfering memory representations away from one another (neural differentiation). Previous work found that, when an item predicted in a particular context (A predicts B) failed to appear and was later restudied in a different context, the A and B representations became less similar in the hippocampus. We used fMRI to test the preregistered hypothesis that rapid eye movement (REM) sleep (occurring post-prediction-error) is required to observe this effect.
Methods: In the morning, we first obtained pre-learning fMRI "snapshots" of each item's neural representation by extracting the spatial pattern of BOLD activity corresponding to each item. Next, participants viewed a continuous stream of scenes that, unbeknownst to them, followed a pair structure. Each pair had one scene as the first item (scene A) and a different scene as the second item (scene B). Each pair was shown together three times, inserted in the stream continuously amongst the other pairs, creating the expectation that B will follow A. For a subset of pairs, this expectation was then violated on trials where B failed to follow A; the B item was subsequently restudied on its own (i.e., not preceded by its pairmate A). Participants were then randomly assigned to remain awake, take a nap containing non-REM sleep only, or take a nap with both non-REM and REM sleep. Later the same day, we obtained post-learning fMRI snapshots of each item's neural representation.
Results: We used pattern similarity analysis to compare the pre- and post-learning snapshots and found evidence of neural

differentiation of the A and B items in the right CA2/3/DG subfield of the hippocampus, but only in the group whose nap contained REM sleep.
Conclusion: This result provides the first evidence linking REM sleep to changes in the hippocampal representations of specific memories in humans, and - more generally - suggests that REM helps to restructure neural representations in response to competition that occurs during wake.
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0059

A TRANSFORMER MODEL FOR PREDICTING COGNITIVE IMPAIRMENT FROM SLEEP

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Introduction: Sleep disruptions have been found to have a strong association not only with normal cognitive decline that occurs with age, but also with dementia caused by neurodegenerative diseases such as Alzheimer's disease (AD). Predictive techniques that can automatically detect cognitive impairment from an individual's sleep patterns have broad clinical and biological significance. We present an innovative multi-task learning paradigm that leverages deep learning to simultaneously predict cognitive performance measured from two distinct cognitive tests, Cognitive Abilities Screening Instrument (CASI) and Digit Symbol Coding Test (DSCT), using whole-night sleep electroencephalography (EEG) data, sleep stage labels, and covariates in an elderly cohort.
Methods: Our study utilizes data obtained from the Multi-Ethnic Study of Atherosclerosis (MESA) participants randomly assigned to two cohorts: validation (N=470) and training (N=1,110). Our approach uses a multi-task transformer architecture to learn complex patterns of sleep architecture for binary cognitive status prediction. The ground truth binary cognitive status labels (low and high score groups) are generated by using the dataset's median CASI and DSCT values as the thresholds. We use sleep EEG, sleep stage labels, and covariates as inputs and binary CASI and DSCT cognitive score classes as targets to train and validate our model.
Results: Our transformer model achieves an overall accuracy (OA) of 70.21% with an F1-score of 71.43% for CASI and 70.85% with an F1-score of 69.35% for DSCT. In comparison, a neural network trained using 132 handcrafted sleep features as inputs has an OA of 59.57% with an F1-score of 60.08% for CASI and 60.64% with an F1-score of 60.04% for DSCT. The OA and F1-score margins are 10.64% and 11.35% for CASI and 10.21% and 9.31% for DSCT, respectively.
Conclusion: We introduced a deep multi-task learning framework for predicting a person's cognitive status using whole-night sleep EEG data. Our transformer model outperforms the comparison method trained using the handcrafted features in OA and F1-score by a large margin. To our knowledge, this is the first deep learning model for jointly predicting cognitive status based on two different testing instruments from an individual's sleep EEG data.
Support (if any): This work was supported in part by the NIH grant 1R21AG068890-01.

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0060

A META-ANALYTIC INVESTIGATION OF THE EFFECT OF SLEEP DEPRIVATION ON INHIBITORY CONTROL

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Introduction: Research has suggested that varying degrees of sleep deprivation have a detrimental effect on inhibitory control (a collection of neural processes evoked to suppress a prepotent response). This is the first meta-analysis to assess the impact of sleep deprivation on inhibitory control in controlled studies.
Methods: The review was performed following PRISMA guidelines. Four electronic databases, APAPsycINFO, Medline, CINAHL and Embase, were systematically searched from inception to November 2023. Selection criteria included studies that conducted experimentally induced sleep disruption (sleep deprivation protocols) in healthy adults (aged above 18 years, no sleep-related/mental disorders/cognitive impairments) and reported inhibitory control performance defined by the Go/No-Go and/or Stop-Signal Task paradigms. Quality appraisal was assessed using the revised Cochrane Risk-of-Bias Tool for Randomised Trials (RoB 2) and Risk of Bias in Non-Randomised Studies of Interventions (ROBINS-I). Effect sizes (Hedge's g) examining the impact of sleep deprivation on inhibitory control were pooled using random-effects meta-analysis.
Results: Twenty-four studies (n = 712 participants) were included. Sleep deprivation protocols included total sleep deprivation (N= 21 studies), partial sleep deprivation (N= 2) and both (N= 1). Seventeen studies used the Go/No-Go Task, and seven studies used the Stop Signal Task. The meta-analysis showed sleep deprivation negatively affected inhibitory control as measured by the Go/No-Go and Stop-Signal (Hedge's g = 0.481, [95% CI: 0.361 to 0.600], $p < .001$, $I2 = 43\%$). Sleep deprivation effects were similar across Go/No-Go (Hedge's g = 0.475, [95% CI: 0.346 to 0.604], $p < .001$, $I2 = 34\%$) and Stop-Signal performance (Hedge's g = 0.482, [95% CI: 0.190 to 0.773], $p < .001$, $I2 = 63\%$).
Conclusion: Our findings demonstrate that sleep deprivation has a significant negative impact on inhibitory control as measured by Go/No-Go and Stop-Signal. These results have important implications regarding the impacts of sleep deprivation on the ability to suppress prepotent responses. Resultant impaired decision-making, higher levels of risk-taking behaviours and difficulties in stopping and modifying planned actions may have real-world consequences for workplace or vehicular safety.
Support (if any): Deakin University Postgraduate Research Scholarship (DUPRS)

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0061

PULLING AN ALL-NIGHTER IMPAIRS ORGANIC CHEMISTRY LEARNING: AN AT-HOME, ZOOM-BASED SLEEP DEPRIVATION EXPERIMENT

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Introduction: College students often believe that cutting back on sleep is necessary to have success in rigorous gateway courses like organic chemistry. At the same time, experimental sleep deprivation is known to impair laboratory tests of cognitive functioning. We bridged these naturalistic-laboratory approaches by testing whether a single night of total sleep deprivation impacted at-home learning and retention of an ecologically-valid organic chemistry lecture.
Methods: Undergraduate students (N=36; Mage = 19.22; 68.8% female; 59.4% non-white) who had not taken organic chemistry and were not chemistry pre-majors completed a 5-day study. At baseline, participants visited the laboratory to complete questionnaires, computerized tasks, and receive wristband actigraphy and an Oura ring. The following night, participants joined an online Zoom session and were randomly assigned to go to bed at 10:30pm or to undergo a night of total sleep deprivation. Caffeine and other substances were not allowed overnight. At 7:30am, all participants completed a virtual organic chemistry lecture and a 50-item test. After a two-day washout period, participants returned to the laboratory for a second organic chemistry test to assess retention.
Results: Most participants (n=32) completed all study phases, and only one withdrew due to sleep deprivation. Actigraphy and ring monitoring confirmed that participants in the normal sleep condition slept on the experimental night (actigraphy M=7.37 hours, ring M=7.64 hours), whereas participants in the sleep deprivation condition did not sleep [actigraphy M=0.08 hours, ring M=0.08 hours; ts>35, ps<.001, cohen's ds > 12]. Sleep deprivation altered perceived stress and metacognitive outcomes [t(30) = 2.11, p = .043, d = .75 and t(30) = 3.27, p = .003, d = 1.16) and significantly impaired morning organic chemistry learning (M=47.4%) compared to normal sleep [M=60.8%; t(30) = 2.11, p = .044, d = .75]. Similar trends were observed at the two-day retention test (Sleep deprivation: 46.4%; Normal sleep: 57.1%, p>.05, d = .55).
Conclusion: Pulling an all-nighter was sufficient to compromise complex educational learning. Sleep deprivation experiments can be feasibly conducted in participants' homes so long as they are video-monitored by research staff and wakefulness is confirmed by wearable sleep trackers.
Support (if any): National Science Foundation (1943323) and Baylor URSA (#2412).

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0062

MEMORY FOR TEXT MEANING IS MAINTAINED DURING 24 HOURS OF CONTINUOUS WAKEFULNESS

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Introduction: Total sleep deprivation (TSD) has been shown to impair associative memory, but little is known about the effects of TSD on memory for naturalistic text. Naturalistic text has different levels of representation: memory for surface form (verbatim text), which is short-lived; memory for textbase (ideas expressed in the text); and event model (representation of the situation described in the text). We investigated whether TSD differentially impacts memory by level of representation.
Methods: N=10 female active-duty dayshift (DS; n=5) and nightshift (NS; n=5) workers (ages 35.1±8.1y) matched by age participated in a 36h laboratory study. After waking at their habitual wake time (DS: 05:57±64min; NS: 12:52±62min) and working their normal shift, participants arrived at the laboratory at 08:00 (DS) or 20:00 (NS). Following a 2h acclimation period, participants completed a 24h constant routine protocol with continuous wakefulness, followed by recovery sleep 1h later. 1h into the constant routine, participants read three narrative texts (self-paced). Memory for text was tested immediately (3h awake), 1h later (4h awake), and 24h later (27h awake). Participants saw 64 recognition probes per text, which varied by whether they required memory for surface form, textbase, or event model. Discriminability indices were calculated for each level of representation.
Results: Mixed-effects ANOVA with fixed effects of test bout (0h, 1h, 24h after reading), level of representation, and their interaction, covariates for shift and age, and a random intercept over participants showed a significant effect for level of representation (F=32.17, p< 0.001). Memory for surface form, which was near chance levels, was worse (p< 0.05) than that for textbase and event model, which did not differ from each other (p=0.271). There was no significant effect for test bout (p>0.1).
Conclusion: Memory for naturalistic text was not significantly impaired by 24h TSD. Memory for surface form was at chance level throughout, as expected since it is known to be short-lived. However, memory for textbase and event model, which reflect text meaning, was retained despite the anticipated impact of TSD on associative memory. The widespread associations in texts may provide more cues to facilitate retrieval and maintain memory performance during TSD.
Support (if any): CARE Fund FY22-POP-02; HSSA

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0063

SLEEP DEPRIVATION IMPAIRS SHORT-TERM OBJECT RECALL ON A SERIAL NOVEL OBJECT RECOGNITION TASK IN RATS

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Introduction: Novel Object Recognition (NOR) is a rodent behavioral task used to test recall based on the time taken to explore a novel versus familiar object. Sleep deprivation (SD) compromises object discrimination, but time of day and interphase interval (IPI) are important to performance. While the effects of SD on NOR have been investigated with a single object recall opportunity, SD preceding short-term recall combined with serial trials has not been reported. Serial paradigms are important for establishing baseline performance and predicting future performance altered by practice effect and habituation. Here we present a unique serial NOR paradigm that assesses baseline performance, SD, and IPI effects.

Methods: Male Sprague Dawley rats (N=20) were housed on a ZT0-ZT12 light cycle with baseline NOR testing at ZT12. Ten rats were randomly assigned to SD during the light cycle and the remaining controls slept undisturbed. Treatment testing also occurred at ZT12, after which SD rats were allowed to sleep, and recovery testing followed at ZT14 or ZT16. Each testing session included three phases: acclimation (no objects), familiarization (identical objects), and recognition (novel/identical objects) with < 4 minutes between phases. The recognition phase object discrimination ratio (DR) was analyzed using a mixed-effects ANOVA, with fixed effects of testing (baseline, treatment, recovery), group (control, SD), and their interaction. Secondary analyses assessed the effect of recovery-delay timing (ZT14, ZT16).
Results: There was a significant main effect of group ($F[1,18]=7.64, p=0.013$) and group by test interaction ($F[2,36]=6.52, p=0.004$). There were no differences between groups at baseline or recovery and no differences in recovery-delay. During the treatment test, SD rats were unable to recognize the novel object compared to controls ($p< 0.001$), spending more time with the familiar object ($p< 0.001$). Control rat performance worsened at recovery compared to treatment ($p=0.033$).
Conclusion: The serial NOR established baseline performance, which was associated with behavioral changes over time. SD significantly inhibited short-term recall, while controls presented stable performance from baseline to treatment testing, with significant performance deficits from treatment to recovery. This decrement may stem from habituation due to a short IPI and/or a time-of-day effect.
Support (if any): WSU College of Medicine Department of Translational Medicine and Physiology

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0064

SLEEP LOSS AFFECTS ITEM AND SOURCE MEMORY DIFFERENTIALLY AS A FUNCTION OF SEROTONIN TRANSPORTER (5-HTTLPR) GENOTYPE

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Introduction: Remembering relationships between items (information) and the contexts (sources) in which they are framed is crucial for everyday functioning. Total sleep deprivation (TSD) impairs this ability, with evidence suggesting that TSD affects source memory even when items are remembered. Source memory deficits imply problems with associative memory, which relies on hippocampal functioning, known to be altered by TSD. Serotonin is highly expressed in the hippocampus, is influenced by TSD, and may be part of a mechanism by which TSD degrades source memory. We investigated the association between 5-HTTLPR, a functional length polymorphism of the human serotonin transporter gene (SLC6A4), and item and source memory during TSD.
Methods: N=34 healthy adults (ages 27.3±4.9y; 18 female) participated in a 4-day/3-night laboratory TSD study. Participants underwent 38h TSD, preceded and followed by 10h sleep opportunities. At baseline and 24h later during TSD, they completed an item/source memory task. Participants listened to a list of 60 words each presented by a male or female speaker (study phase). They were then tested for recognition of the words (items) out of 60 old and 60 new words presented visually, and were asked to identify the corresponding speakers (sources, male or female).
Results: The genotype distribution was in Hardy-Weinberg equilibrium (P=0.34), with 35.3% long/long, 41.2% long/short, 23.5% short/short. Mixed-effects ANOVA showed a significant adverse effect of TSD for both item recognition ($P< 0.001$) and source recognition ($P< 0.001$), where TSD degraded source memory even when item recognition was accurate. There were no 5-HTTLPR genotype effects on item memory. However, there was a significant main effect for genotype on source memory ($P=0.019$), and a genotype by TSD interaction ($P=0.018$). For accurately recognized items, source memory was largely preserved for the short/short genotype but impaired for carriers of the long allele, and especially the long/long genotype.
Conclusion: 5-HTTLPR genotype predicted source memory deficits from TSD, distinct from item memory deficits unaffected by genotype, which confirms that item and source memory deficits due to TSD are dissociable. Furthermore, TSD's impact on binding of items and sources in memory may be mediated by hippocampal serotonin.
Support (if any): NIH R21CA167691, WSU Anthony Marchionne and Foundry10 Bridge fellowships

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0065

DETERMINING THE IMPACT OF EXTENDED WAKEFULNESS ON MEMORY RETENTION

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Introduction: It has been well-established that the rate of forgetting slows if learning is followed by a period of sleep versus wake. Although several studies compared rates of retention for material learned before sleep or sleep loss, none have explicitly examined how extended wake, without intervening sleep, impacts the rate at which information is forgotten. To explore this further, we investigated the effects of sleep deprivation on memory retention over extended wakefulness in dayshift (DS) versus nightshift (NS) participants.
Methods: N=22 adult shift workers (DS: n=17 and NS: n=5; aged 38.3±8.9 years; 12 females) participated in a 36-hr in-laboratory study. They adhered to their habitual wake time (DS: 5:50am; NS: 1:15pm) at home and arrived at the laboratory at 8:00am (DS)/8:00pm (NS). After a 2-hr acclimation period, participants followed a 24-hr constant routine protocol, which included continuous wakefulness. During the study, participants completed a memory task requiring the memorization of 20 nouns, ranging from 4-6 letters. The words were each individually presented on a computer screen for 10 sec. Recall sessions occurred immediately (session 1; 1+ hrs awake), 1 hr (session 2; 2+ hrs awake) and 24 hrs (session 3; 25+ hrs awake) post-memorization. The variable of interest is the proportion of words correct.
Results: A mixed-effects ANOVA, with fixed effects of session (1-3), shift (day vs. night), and their interaction, controlling for age, and a random intercept for participants, showed a significant main effect of session on the proportion of words correct ($F[2,38]=36.65, p< 0.001$). Overall, the proportion of correctly recalled words decreased across sessions, with performance decreasing 12.5% from immediate to 1-hr, 18.8% from 1-hr to

24-hr, and 29.0% overall from immediate to 24-hr. Shift type and age did not significantly affect performance (p>0.05).
Conclusion: The outcomes of this study replicated previous findings demonstrating the degradation of memory recall under the influence of sleep deprivation. The pattern of performance aligns with the conventional forgetting curve, in which forgetting occurs rapidly soon after learning, typically within the first hour, with the rate gradually decreasing over time. Future research will examine if continuous wakefulness exacerbated this memory decline.
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0066
REACTIVATING REMOTE EMOTIONAL MEMORY BEFORE SLEEP IMPACTS DREAM AFFECT, BUT NOT DREAM CONTENT

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Introduction: Completing a learning task just before sleep often induces task-related dreams. This is thought to reflect the consolidation of recently formed memories in the sleeping brain. However, this literature has focused almost exclusively on how recent experiences newly introduced before sleep are incorporated into dreams. It is unknown whether and how remote memories may also be reactivated during sleep and incorporated into dreaming.
Methods: We aimed to experimentally trigger participants to dream about a remote emotional episodic memory. Just before a nap, participants (N = 34) completed the Autobiographical Emotional Memory Task (AEMT). In this task, participants were asked to recall and write about "the one situation that has made you the most angry you have been in your life". In a control condition (within-subjects), participants instead wrote about designing a new college course. During the subsequent nap, participants were awoken up to four times to report their dream experiences. Following the nap, participants rated the extent to which they felt each dream was related to the earlier writing task, and rated the emotional valence of each dream.
Results: The AEMT elicited negative mood (pre-nap PANAS-negative score in AEMT vs. control condition: $t(33)= 6.20$, $p< 0.0001$). Although participants rated some dreams as related to the pre-sleep writing task in both conditions, dreams were not significantly more related following the AEMT, as compared to the control condition (Wald test: $\chi2(1)=2.67$, $p=0.10$). However, dream emotion was significantly more negative following the AEMT, relative to the control condition (Wald test: $\chi2(1)=5.15$, $p=0.02$). This effect was strongest for the first dream reported.
Conclusion: Recalling a personal memory had no greater influence on dream content than writing about a neutral, memory-nrelated topic. At the same time, recalling a remote, emotional memory before sleep did affect the emotional valence of dreams. These data echo observations dating back to the 1960s suggesting that while transparent representations of presleep experience in dreams are rare, emotional stimuli do reliably influence dream affect. This might reflect emotional memory consolidation, or be a more general influence of pre-sleep mood on subsequent emotion during sleep.
Support (if any):

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0067
THE EFFECT OF AGING ON EMOTIONAL MEMORY ENCODING AND CONSOLIDATION OVER SLEEP AND WAKE

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Introduction: Sleep is essential for the consolidation of emotional memories. Young adults exhibit a bias towards consolidation of negative memories over sleep while older adults exhibit a bias towards consolidation of positive memories over sleep. As this parallels known biases in emotional memory encoding, it is unclear whether biases found after sleep are simply carried over from biases prior to sleep or if sleep amplifies emotional memory biases. Thus, the present study assessed emotional memory before and after intervals of sleep and wake to determine whether sleep biases the selectivity of emotional memory.
Methods: Healthy younger (N=52, 18-30 years; YA) and older adults (N=38, 50-80 years; OA) completed two conditions: a positive and negative emotional memory task. Emotional images were viewed followed by an immediate recognition assessment before overnight sleep (Sleep group; YA=29, OA=19) or before a day of wakefulness (Wake group; YA=23, OA=19). Delayed recognition was assessed approximately 12-hrs later. For the Sleep group, polysomnography was recorded. To assess differences in memory change (delayed minus immediate recognition) between condition (negative vs. positive), group (Sleep vs. Wake) and age (YA vs. OA), ANOVAs were conducted.
Results: There was a significant interaction between the effects of condition (positive vs. negative) and group (sleep vs. wake) ($p=0.03$) such that sleep (relative to wake) benefitted negative but not positive memories regardless of age. Investigating age groups separately, both younger ($p=0.06$) and older ($p=0.06$) adults tended to display this interaction. We next considered change in negative memory bias (negative – positive performance) between immediate and delayed recognition. There was a near-significant main effect of group ($p=0.06$), indicating that negative bias increased in the sleep compared to wake group.
Conclusion: These findings suggest sleep may impart a negative memory bias. This is consistent with our prior work in young adults but unexpected in older adults. This may suggest that, like young adults, healthy older adults preferentially consolidate negative over positive emotional memories during a night of sleep. Therefore, sleep-dependent emotional memory consolidation may be preserved even as sleep and memory decline with aging. Future analysis will examine associations between sleep architecture and emotional memory performance.
Support (if any): NIH R01AG040133(PI: Spencer)

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0068
THE IMPACT OF TRANSCUTANEOUS VAGAL NERVE STIMULATION ON SLEEP-DEPENDENT EMOTIONAL MEMORY

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Introduction: The autonomic nervous system (ANS) supports memory, with peripheral activity, through the vagus nerve, enriching or impairing acquisition and consolidation, especially for emotional experiences. Sleep is critical for memory consolidation and has been implicated in affective regulation. Yet, the causal impact of the ANS during sleep for memory has not been rigorously assessed. The current project examined the impact of non-invasive vagal nerve stimulation during sleep on emotional memory consolidation
Methods: 24 participants (Mean age = 22.82; 13 Male; 11 Female) completed two nights of polysomnographic recordings - one with 90-mins of active transcutaneous vagal nerve stimulation during NREM sleep and one with sham stimulation - counterbalanced across participants. Emotional memory was assessed via a picture recognition task. Sixty images were presented during a pre-sleep encoding session (30 negative and 30 neutral). Recognition memory (15 old/negative, 15 old/neutral, 15 new/negative and 15 new/neutral) was assessed twice, 30-mins after encoding (Test 1) and post-sleep (Test 2). Outcome metrics included d' (sensitivity), c (bias criterion), and c' (corrected sensitivity). Change scores (Test 2 -1) were calculated. Mixed-model repeated measures ANOVAs with self-reported biological sex as a between-subjects factor were used to assess the impact of stimulation (active vs sham) and valence conditions (negative vs neutral) on memory processing.
Results: For d', a significant sexXstimulation interaction emerged, $F(1,22)=6.66, p=0.017$. Male participants performed better in the sham condition ($p=0.035$), but this effect was attenuated in the stimulation condition ($p=0.236$). Participants exercised a stricter criterion when receiving active vs. sham stimulation and were less likely to indicate that they remembered stimuli that they viewed during encoding at test ($p=.051$). Given this, we examined c' to adjust for response bias. We found a significant effect of emotion ($p=.025$) and a marginal effect of stimulation condition ($p=.058$). Across sleep, participants were better at discriminating between previously encoded neutral images than negative images. Sleep-dependent discrimination performance also improved after active stimulation ($c'=0.086$) but declined under sham ($c'=-0.018$; $p=.058$).
Conclusion: These are the first data to suggest causal links between sleep-dependent autonomic activity and next-day memory processing. Analyses of polysomnographic sleep features linked to these outcomes are in progress.
Support (if any):

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0069
WITHDRAWN

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0070
THE EFFECT OF POST-LEARNING REST ON FALSE MEMORY IN THE DEESE-ROEDIGER-MCDERMOTT PARADIGM

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Introduction: Although sleep has long been known to benefit memory consolidation, recent studies demonstrate that even a brief period of eyes-closed waking rest can similarly benefit a wide variety of memory types, including declarative, procedural and spatial. But sleep is argued to not only quantitatively strengthen memory traces, but also qualitatively transform them over time. The present study tested whether post-encoding waking rest affects the formation of false memories in the Deese-Roediger-McDermott (DRM) false memory paradigm, which are thought to arise from a "gist extraction" transformation of memory. We hypothesized that rest would increase false memory as measured by recall, but decrease false memory as measured by recognition.
Methods: In a within-subjects, counter-balanced design, N=51 participants auditorily encoded 8 DRM word lists. Each list consisted of 15 semantically-related words, all of which were derived from a central "critical lure" not heard by participants. After encoding, participants either sat quietly with their eyes closed for 15 minutes or spent an equivalent period of time completing a distractor task. Afterwards, participants were tested on their memory via both recall and recognition. False memory was defined as the false recall or recognition of "critical lure" words that had not been included on the list. Scores on the recall test were adjusted for incorrect responses, by subtracting the number of words incorrectly recalled (not including the lure words) from the number of words correctly recalled.
Results: Paired samples t-tests revealed that there was no significant effect of rest on false memory using either recall ($t(50)=.26$, $p = .796$) or recognition ($t(50)=1.20$, $p = .237$) tests. There was also no significant effect of rest on memory for studied words (recall: $t(50)=1.32$, $p = .194$; recognition: $t(50)=0.51$, $p = .612$).
Conclusion: This study indicates the possibility that waking rest does not affect certain types of qualitative memory transformation thought to occur during sleep. This includes the gist-extraction type processes underlying false memory. Potentially, rather than acting independently of each other, waking rest and sleep may act in coordination, each with distinct roles in the consolidation process.
Support (if any): Intramural funding from Furman University.

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0071
DOES ADDITIONAL TRAINING ON A MOTOR SEQUENCE TASK IMPROVE SLEEP-DEPENDENT MEMORY CONSOLIDATION FOR OLDER ADULTS?

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Introduction: While sleep can improve memory performance, not all memory domains demonstrate this effect. Prior studies show that hippocampal engagement during encoding is necessary for subsequent sleep-dependent memory consolidation. However, motor sequence learning typically engages other areas and inconsistently demonstrates sleep-related gains, particularly among older adults. Hippocampal engagement via explicit sequence awareness and strong learning ability increases the possibility of sleep-related procedural memory gains. Therefore, we compared sleep-dependent memory consolidation on an explicit motor sequence task in older adults who received standard training to those who received additional training.
Methods: Healthy older adults (N=24; 67.7 ± 4.5 years; 71% female), assigned to a standard training group (n=12) or an over-training group (n=12), were trained on an explicit motor sequence learning task; standard training comprised 5 blocks

of practice while over-training included 10. Performance was tested before ("immediate") and after ("delayed") a day spent awake and a night spent asleep (conditions separated by ~1 week, order counterbalanced). Skill learning was calculated by subtracting median reaction time during learned sequences from that of randomly-cued button presses. Change in skill learning from immediate to delayed test for the wake interval was contrasted with change across sleep, resulting in a sleep benefit score. Sleepiness was assessed using the Stanford Sleepiness Scale prior to each testing session. Polysomnography (32-channel, Brainvision) was recorded during the overnight sleep visit.

Results: A planned comparison of immediate test results, to check baseline differences resulting from training, showed that the over-training group was significantly faster than the standard training group ($t(23)=4.796$, $p<.001$, $d=1.18$). Analysis of sleep benefit scores showed no significant benefit with standard training ($t(11)=0.778$, $p=.453$) or over-training ($t(10)=1.342$, $p=.209$), and over-training does not provide a significantly greater sleep benefit than standard training ($t(23)=4.796$, $p=.590$).

Conclusion: Our results replicate prior findings that standard training of a motor sequence task in older adults does not demonstrate sleep-dependent memory gains. Moreover, here we show that additional training does not improve the chances of demonstrating such gains, despite significantly improving initial performance. Because sleep spindles have been previously linked to motor sequence learning across sleep, future analysis will include polysomnography recordings.

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0072

PRELIMINARY STEPS TOWARDS AN OVERNIGHT INTERVENTION TO HELP INDIVIDUALS WITH AGE-RELATED MEMORY DIFFICULTIES

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Introduction: Sleep supports memory consolidation and can prevent memories from being forgotten. Targeted Memory Reactivation (TMR) is an experimental technique that boosts the natural replay of recently acquired memories during sleep and can bias which memories are consolidated. TMR has been applied in many experiments by softly playing sounds associated with specific memories during slow-wave sleep, while not disrupting sleep. We developed a TMR algorithm that can be used in the home, with the future goal of decreasing forgetting for certain high-value information in seniors, particularly those with early-stage Alzheimer's Disease.

Methods: In young healthy adults, we developed a learning procedure with 20 relationships and associated biographical information. We tested whether recall could be improved using TMR. On Day-1, participants learned relationships and facts about simulated family members (e.g., "Your youngest son is Clifford; Clifford is an architect"). After a short delay, they were tested on this information (e.g., "Your youngest son is___? Clifford's occupation is___?"). On Day-2, participants learned interfering information about 10 simulated neighbors, followed by memory testing. While sleeping in their home for the next 3 nights, participants received auditory TMR cues during sleep using wearable sleep technology. Participants received either spoken questions about their simulated family (n=20, TMR group) or reversed sounds (n=20, control group). On Day-5, memory was tested again.

Results: Free recall of relationships and biographical information for the simulated family improved in the TMR group, whereas it declined in the control group (Day-5 vs. Day-1). Furthermore, recall confidence decreased less in the TMR group than in the control group (Day-5 vs. Day-1).

Conclusion: Results indicate that memory for specific information can be improved with overnight TMR sounds delivered in the home environment. The information was arbitrary person-specific knowledge that was recently acquired, but a parallel improvement may also be achievable in older individuals experiencing difficulty recalling high-value information subject to forgetting in their own lives. We are thus beginning studies in older individuals to test this possibility.

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0073

DO SLOW WAVE SUB-TYPES SERVE DISTINCT ROLES IN SLEEP HOMEOSTASIS AND PLASTICITY?

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Introduction: Recent research distinguishes two slow wave (SW) subtypes: slower (SSW) and faster slow waves (FSW). Early research on these subtypes suggests that FSW positively correlate with sleep pressure, while SSW are associated with memory. Developmental data from children who nap provide an opportunity to test this distinction. Prediction 1: If FSW are associated with sleep pressure, we expect more FSW during overnight sleep when children do not nap compared to overnight sleep following daytime naps. Prediction 2: If SSW are associated with memory, we expect stronger and more synchronized coupling between spindles (SP) and SSW compared to FSW, reflecting memory processing.

Methods: This is a secondary analysis of data from 25 children (3-5 yrs). Children participated in two conditions; they either napped (NO) or stayed awake (WO) during the daytime nap interval. The nap and subsequent overnight sleep in both conditions was PSG-recorded. SWs (0.5-4 Hz) and SPs (10.3-13.3 Hz) were detected during NREM sleep in the frontal region. To distinguish between slow and fast SWs, the transition frequency from the down-to-up state of SWs was utilized. Coupling amount (strength) and direction of coupling (phase) were quantified for both SSW-SP and FSW-SP coupling.

Results: Prediction 1: A higher occurrence of FSW were observed during WO compared to NO ($t(24)=-2.70$, $p=0.01$). However, after adjusting for NREM sleep duration, FSW density did not differ between NO and WO ($p=0.75$). Prediction 2: SSW-SP coupling strength was lower compared to FSW-SP coupling strength during WO ($t(24)=-2.43$, $p=0.02$), but there were no differences in the NO condition ($p=0.25$). Additionally, there were no significant differences in the coupling phase between SSW-SPs and FSW-SPs in either overnight bout ($p>0.45$).

Conclusion: Increased sleep pressure (nap absence) did not directly affect FSW density. Instead, the absence of naps extended NREM sleep duration, elevating FSW occurrence. Moreover, SSW-SP coupling was weaker than FSW-SP coupling

and only during WO, contrary to our prediction that SSW are associated with learning. While it is possible that SSW and FSW functionality is still developing at this age, these data fail to support predictions of the distinct role of SW subtypes.
Support (if any):

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0074
SLEEP SLOW OSCILLATIONS DIFFER IN DEPTH PROFILES BASED ON THEIR COUPLING WITH SPINDLES: A CLASSIFICATION STUDY

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Introduction: Slow oscillations (SOs) are large amplitude events in the electroencephalogram and contribute to sleep functions including homeostasis and consolidation of episodic memory. Complexes of one SO and one sleep spindle, where a spindle follows an SO trough within a short delay, are causally connected to sleep-dependent episodic memory improvement. In this study, we compare the cortical-subcortical brain currents that underlie SOs paired to spindles (SO+) and unpaired SOs (SO-), with the goal of identifying whether networks of activations are different in the two cases. This knowledge is essential to understanding the mechanisms of memory consolidation across brain regions.
Methods: Full-night polysomnography data (64 channel EEG) was acquired in the Mednick Lab for 22 typical young adult participants. Individual SOs and spindles were detected with in-house algorithms at every EEG channel. SO current sources at multiple time instances were found using source estimation software (Brainstorm) and encoded in a matrix representation of region-by-time, where each matrix was labeled as SO+ or SO-. Region-by-time features with strongest differentiation between SO+ and SO- were identified with multivariate feature ranking; classification with K-nearest neighbors and random forest evaluated with Matthew's Correlation Coefficient (MCC) tested differentiability in a pooled dataset. We analyzed light (S2) and deep NREM (SWS) sleep separately.
Results: All classification algorithms achieved high MCC scores, suggesting structural differentiation between SO+/SO-. Within-individual models did not achieve high MCC scores when used to classify another individual's SOs, refuting generalizability across subjects. Subcortical/cortical activity in SO+ vs. SO- was also found to be distinguishable up to 1 second before the SO trough. Additional analysis showed overall higher region-by-time feature interdependence underlying SO+, with the most significant features being the bilateral cortex, hippocampus, putamen, and pallidum.
Conclusion: Successful classification of SO+/SO- indicates the presence of structural differences in cortical-subcortical activation during SO that are spindle-coupled compared to uncoupled. Combined with feature analysis identifying distinct network activations in coupled vs uncoupled SOs, our study suggests a potential functional difference. Ongoing work includes investigating the various feature dependencies that exist within our dataset as well as conducting confirmatory analyses in a separate data subset.
Support (if any):

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0075
INDIVIDUAL DIFFERENCES IN HABITUAL SLEEP DISCONTINUITY PREDICT MEMORY CONSOLIDATION AND SUPPORTING NEURAL ACTIVITY

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Introduction: Numerous studies manipulating sleep (i.e., deprivation, intervening naps between encoding and retrieval) have shown that sleep facilitates episodic memory consolidation in young, healthy adults. The relationship in older adults is more mixed, though generally supportive of age-related attenuations in sleep-dependent memory consolidation. However, studies using manipulations of sleep or a single night of sleep architecture may omit potentially important information about individual differences in one's habitual sleep patterns that may contribute to the episodic memory performance across age. There is great interest in determining if well-known age-related impairments in sleep quality are related to those in episodic memory consolidation and the neural activity supporting memory.
Methods: As part of an ongoing study, we recruited samples of cognitively unimpaired younger and older adults and measured their habitual sleep using a wrist-worn accelerometer for 1 week. Principle component analysis (PCA) was used to reduce data dimensionality and identify sleep components. We recorded their electroencephalography (EEG) as they performed an object-scene associative memory task with immediate and delayed (48 hours) retrieval assessments. Participants were asked during both retrieval phases if object-scene pairs were new, matched or did not match pairs that were presented during encoding. Memory retention (delayed-immediate d') was used as the index of consolidation, correcting for each participant's learning level.
Results: Across age groups, higher levels of habitual sleep discontinuity, which were elevated in older adults, were associated with reduced memory retention/consolidation estimates ($t(11) = -2.74$, $p = 0.02$, $d = 0.81$) and neural activity during delayed retrieval associated with successful recovery of retained memories (rho = 0.499, rho-value = 0.015).
Conclusion: These results support the idea that age-related increases in habitual sleep discontinuity may contribute to age-related reductions in sleep-dependent episodic memory consolidation, and the neural mechanisms supporting successful recovery of consolidated memories.
Support (if any): This work was supported by the NIA # R21AG064309.

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0076
MEMORY CONSOLIDATION DURING SWS OF IMPLICIT VISUOSPATIAL MEMORY ASSOCIATED WITH ODOR

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Introduction: Memory consolidation during sleep is more pronounced during SWS, but this effect depends on the form of learning (implicit or explicit). Also, it is considered that the piriform cortex, the primary olfactory cortex, replay and consolidates the olfactory stimuli perceived before sleep, as well as memories associated with the olfactory stimulus, during SWS.

In this study, we investigated the consolidation of implicit visuospatial memory associated with olfactory stimuli during sleep in human subjects.
Methods: ROCF (Rey-Osterrieth Complex Figure) was used for the visuospatial memory task, and peppermint, liquid paraffin were used as experimental and control stimuli, respectively. Participants performed an implicit learning task in which they copied the ROCF while inhaling the experimental or control odor before nap(No instructions to memorize or test). After the learning, participants completed a baseline test in which they recalled the ROCF without inhaling the odor, and then took a 135-minute nap. After the nap, the ROCF recall test was repeated with inhaling experimental or control odor.
Results: Data from 28 of the 56 participants for whom SWS appeared were used in the statistical analysis. The analysis revealed that the slow-spindle PSD(Power Spectral Density) during SWS in the prefrontal cortex of the group that inhaled the experimental odor during ROCF learning was lower than that of the group in the control odor inhaled group. The results of linear regression analysis using prefrontal slow-spindle PSD as a moderator showed that when prefrontal slow-spindle PSD was lower than average, the memory performance (hit-rate change of ROCF) of the group that inhaled the experimental odor during ROCF learning was higher than that of the group that inhaled the control odor. This difference disappeared where the slow-spindle PSD exceeded the average.
Conclusion: Consolidation of odor associated implicit visuospatial memories during SWS was found to be associated with a decrease in prefrontal slow-spindle activity. Prefrontal slow-spindle activity during SWS is associated with the erasure of unstable memories, and olfactory cortex may suppress this activity to make unstable memories into long-lasting memories.
Support (if any):

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0077

TITLE: TEST FORMAT INFLUENCES THE EFFECTIVENESS OF WAKEFUL REST FOR MEMORY CONSOLIDATION

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Introduction: New memories are stabilized and strengthened during memory consolidation, which is facilitated during sleep. Recent research suggests that wakeful rest (WR), i,e., a period in which attention and other cognitive demands are reduced, May also facilitate memory consolidation. However other studies have failed to find such benefits of WR. Complicating matters, several methodological differences across successful and unsuccessful WR studies exist, including differences in learning material and test format. This experiment examined how test format may influence the effects of WR on memory consolidation.
Methods: Participants completed two consecutive sessions. In each session, they watched a 15-min video and then took an immediate memory test followed by a 15-min break while electroencephalography (EEG) was recorded. During the break, participants engaged in WR by sitting quietly in a comfortable chair in one session and completed a computer game distractor test in the other. Next, participants took a delayed memory test for the video and then completed a mind wandering questionnaire. For 16 participants, the memory test were multiple-choice and for 15 participants, the memory test were free recall.
Results: For participants who took multiple-choice test, let's forgetting occururred from the immediate to the delayed memory test when participants engaged in WR compared to a distractor task during the break, and this difference was larger for participants who engaged in WR during the first session. For participants who took free recall test, although memory improved from the immediate to the delayed test during both sessions, there was no difference in size the improvement when participants engaged in WR compared to a distractor task during the break.
Conclusion: The efficacy of WR or memory consolidation depends on the format in which memory is tested. In the current experiment, WR during the break was more effective than a distractor task for preserving memories when tests were in multiple-choice but not free-call format. Additionally, when using a within-participants design, the order in which WR and the distractor task are completed is also relevant. EEG and mind-wandering data may be useful in understanding context in which WR may be most effective for memory consolidation.
Support (if any):

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0078

THE BRAIN FAILS TO PRE-ACTIVATE THE LOW-LEVEL STIMULUS-FEATURES OF AN EXPECTED STIMULUS

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Introduction: It has been suggested that the human brain is involved in actively predicting upcoming sensory inputs based on previous experience. The extent to which such a mechanism operates during sleep remains elusive. Studies utilizing mismatch negativity (MMN) paradigms report disruption of hierarchical predictive coding in sleep, while others argue for limited but preserved detection of the violation of predictions. Here, we inquire, for the first time, whether the brain actually pre-activates the features of an expected stimulus during sleep.
Methods: In a passive listening nap design (2.5 hours nap opportunity), participants (N=34) listened to sequences of four different auditory tones varying in pitch, presented at a fixed rate of 3 Hz, while we collected simultaneous Electroencephalography (EEG) and Magnetoencephalography (MEG) data. By manipulating the transition probabilities of the tones, we created random and predictable tone sequences. We analyzed the MEG data using multi-level pattern analysis (MVPA) to decode low-level tone properties and to search for evidence of stimulus pre-activations in the predictable tone sequences, when predicting the next tone from the previous one was actually possible. We performed cluster-based permutation across time, time-generalization, as well as cross-state decoding to identify significant above-chance classification time points.
Results: The results indicate that subtle changes in pitch, reflecting low-level stimulus features, are decodable in N1 and N2 sleep. This is in line with previous studies showing preserved but attenuated cortical activations related to the processing of low-level stimulus properties during sleep. Neural codes between states appear to be similar, as we observed high cross-state classification accuracies. In wakefulness, evidence of neural codes of the expected stimuli was found in the prestimulus interval, but

this was not observed in N1 and N2 sleep, suggesting disrupted predictive abilities even in light sleep
Conclusion: Processing of low-level stimulus features persists in sleep, but the detection of stimulus statistics appears to be disrupted.
Support (if any): We would like to express our gratitude to the Doctoral College 'Imaging the Mind' for their financial support (FWF, Austrian Science Fund: W 1233-B)."

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0079
PRELIMINARY ANALYSIS REVEALS LINK BETWEEN VISUAL ATTENTION AND SLEEP DURATION IN ALZHEIMER'S DISEASE

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Introduction: Sleep disturbances have been shown to relate to the development of Alzheimer's disease (AD) and its associated cognitive deficits, including visual attention function. Here, we investigated the potential interactive and additive effects of sleep disruption and AD on visual attention performance and its underlying neural mechanisms.
Methods: Preliminary analysis included 33 participants, 10 patients on the AD spectrum (mild cognitive impairment (MCI) and AD; 7 females; Mage: 70.24) and 23 cognitively-healthy older adults (17 females; Mage: 67.47). Participants completed a visual search task during magnetoencephalography (MEG). Participants also wore an Actigraph device on their non-dominant wrist for a two-week period. Actigraph data were cleaned using sleep diaries and analyzed using the Cole-Kripke algorithm. Total sleep time (TST) was calculated for each night of sleep and averaged across all nights of sleep collected. The MEG data were transformed into the time-frequency domain and significant task-related oscillatory responses were source-imaged using a beamformer.
Results: Behavioral analysis of the visual search task revealed a significant condition effect, such that reaction times (RT) in the conjunctive trials were significantly longer than those in the feature condition ($p < .001$). There was a trending group-by-condition interaction on RT ($p = .080$), such that patients on the AD spectrum showed larger differences in reaction times between conditions than healthy controls. Additionally, there was a significant group by TST interaction on RT ($p < .001$) showing that patients on the AD spectrum with less sleep had longer RT, while there was no such relationship in the controls. Regarding the MEG data, we observed robust neural responses in theta, alpha, and beta frequency bands. Analysis of source-imaged neural responses in the alpha range revealed significant conditional differences in the right posterior temporal lobe ($p < .005$), a significant group-by-condition interaction in the right temporoparietal junction (TPJ; $p < .005$), and interestingly, a group-by-TST interaction on conditional differences in alpha power ($p < .005$) in right occipital and cerebellar regions.
Conclusion: Our preliminary results show key relationships between total sleep time, visual attention behavioral performance, and neural recruitment, and how these relationships may differ in AD spectrum conditions.
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0080
SELECTIVE BRAIN AND EYE RESPONSES TO AUDITORY STIMULI DURING PHASIC AND TONIC REM SLEEP

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Introduction: Rapid eye movement (REM) sleep is divided into phasic and tonic episodes based on the presence or absence of eye movements, respectively. Phasic REM, often linked with dreaming, is traditionally seen as a phase of brain isolation from the surroundings. On the contrary, during tonic REM periods, the brain is thought to maintain a stronger connection to the environment and a higher sensitivity to external stimuli. However, the processing of external information during these distinct REM microstates is not well-understood. Here, we aim to investigate sensory processing during REM microstates by analyzing brain and eye responses to different auditory stimuli.
Methods: We analyzed high-density electroencephalography (EEG) data from 17 healthy subjects over a full night's sleep. Auditory stimuli included the subjects' own name (SON) and two unfamiliar names (UNs), spoken by familiar (FV) and unfamiliar voices (UFV). REM sleep was categorized into one-second epochs of either phasic and tonic episodes based on rapid eye movement occurrence. Our analysis encompassed multivariate decoding, event-related and time-frequency analyses, examination of aperiodic EEG activity, and measuring the velocity of the evoked eye movement responses.
Results: Tonic REM showed more microarousals and a shallower EEG slope than phasic REM, suggesting increased external processing and more excitatory cortical activity. Further, auditory brain responses during tonic REM revealed stronger alpha (8-12 Hz) and beta (13-30 Hz) responses to responses to UFVs as compared to FVs. In contrast, during phasic REM, we observed stronger desynchronization in the delta (1-4 Hz) frequency range in response to UFVs as compared to FVs. No difference in brain responses to the different names was observed. However, eye responses to SONs were notably stronger than to UNs during phasic REM periods.
Conclusion: Our findings support existing theories that suggest a preference for unfamiliar stimuli processing during sleep. We extend previous findings by showing that such preference is perserved in REM sleep as well. We also found that eye movements in phasic REM can distinguish between sounds, indicating partial brain responsiveness to the environment during dreaming episodes. These results enhance our understanding of REM sleep's complex nature and the neural activities occurring during this intriguing sleep stage.
Support (if any):

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0081
SLEEP AS A MEDIATOR BETWEEN HOUSING CONDITIONS AND COGNITIVE IMPAIRMENT

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Introduction: Adverse housing conditions are associated with cognitive impairment; however, the mechanism is not fully understood. Adverse housing can affect sleep – an essential

physiologic activity for cognitive function, yet this pathway is understudied. We tested associations between housing condition, sleep disturbances, and cognitive impairment.
Methods: This study utilized data from the Health and Retirement Study, a longitudinal panel study among adults (2020). Participants (n=2,346) completed questionnaires on housing, sleep disturbances, and cognition. Housing was measured by self-reported ratings of their homes physical condition (1-excellent to 5-poor), and further categorized as poor/fair vs. excellent/very good/good. Sleep disturbances were self-reported as trouble falling asleep, trouble waking up during the night, and trouble with waking up too early and not being able fall asleep again, and each item was scored from 0 (rarely/never) to 2 (most of the time). Subjective and objective cognitive impairment was defined as a participant rating of fair or poor regarding their memory at the present time and by diagnostic classification, respectively. Logistic regression models were fit to test associations between housing and sleep and cognitive impairment after adjustment for covariates. A bootstrapped, model based, causal mediation analysis was conducted to calculate the effect of sleep on housing and cognition.
Results: The sample had a mean age of 66.5 + 0.21 years, and 56% were female, 10% Black, 80% White, and 10% other racial group. There was a high prevalence of cognitive impairment (subjective: 25%, objective: 34%) and sleep disturbance (38%). Individuals living in fair/poor vs. excellent/very good/good housing conditions had higher odds of sleep disturbances [Adjusted Odds Ratio (aOR)=3.72, 95% confidence interval (1.89, 7.36)] and cognitive impairment [Subjective aOR=3.74 (1.73, 8.06) and Objective aOR=4.71 (2.07, 10.70)], respectively. Sleep disturbances were associated with higher odds of cognitive impairment [Subjective aOR=2.42(1.51, 3.88) and Objective aOR=1.72 (1.04, 2.87)]. The formal mediation results showed that sleep partially mediated the association between housing and cognitive decline (15% subjective and 9% objective).
Conclusion: Results suggest that sleep may explain a portion of the association between housing conditions and cognitive impairment. Targeting sleep and determinants of sleep (i.e., housing), may reduce cognitive impairment.
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0082

SLEEP HEALTH AND DAYTIME COGNITIVE FUNCTION: DATA FROM THE NATIONAL SLEEP FOUNDATION SLEEP IN AMERICA POLL

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Introduction: Previous studies have shown that poor sleep is generally associated with daytime dysfunction. But few studies have examined this relationship in the general population across many dimensions of sleep health and it is not clear which sleep variables are most salient.
Methods: Data were collected as part of the National Sleep Foundation Sleep In America Poll. The population-based sample (N=1,042) provided data on a range of sleep questions. For the present analyses, self-reported difficulty concentrating during the day was examined as a nominal outcome (none vs occasional or frequent), with population-weighted regression analyses adjusted for age, sex, race/ethnicity, education, income, and PHQ2 depression score. Independent variables included sleep satisfaction, feeling refreshed, daytime energy, difficulty falling, frequent nighttime awakenings, difficulty resuming sleep, satisfaction with weekday and weekend sleep duration, ability to feel relaxed, overall sleep quality, weekday and weekend bedtime, waketime, time in bed, and sleep duration, perceived sleep need, and days/week (0-7) of: feeling well-rested, having trouble falling or staying asleep, sleep impacts functioning, daytime sleepiness, and sleep medication use. Bonferonni correction (0.05/26) was used.
Results: The following were associated with frequent daytime cognitive problems: poor sleep quality (RRR=17.9), fewer days well rested (RRR=0.66/day), and more days with difficulty falling asleep (RRR=1.56), difficulty staying asleep (RRR=1.47/day), days sleep impacts functioning (RRR=1.78/day), and days of daytime sleepiness (RRR=1.22/day), less sleep duration on weekdays (RRR=0.58/day) and more sleep debt (RRR=1.65/hr), low sleep satisfaction (RRR=33.93), rarely feeling refreshed (RRR=34.68), low energy (RRR=70.41), severe difficulty falling asleep (RRR=19.23), waking up (RRR=15.63), resuming sleep (RRR=12.86) and feeling relaxed (RRR=65.66), and dissatisfaction with sleep duration on weekdays (RRR=45.15) and weekends (RRR=28.42). In a stepwise regression model examining daytime concentration difficulties as an ordinal variable, after adjusting for covariates, the variables that explained the most unique variance were (in order) days/week sleep impacts functioning, ability to become relaxed, daytime energy, and difficulty waking in the night.
Conclusion: Many indicators of sleep health were associated with daytime dysfunction, implicating sleep duration, quality, efficiency, and daytime effects of sleep. Efforts might ideally focus on the daytime impacts of sleep rather than nighttime experiences.
Support (if any):

Abstract citation ID: zsae067.0083

0083

YOU DON'T SNOOZE, YOU LOSE (AWARENESS): SLEEP'S ROLE ON AWARENESS OF COGNITION IN MILD COGNITIVE IMPAIRMENT

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Introduction: In adults with Mild Cognitive Impairment (prodromal phase of Alzheimer's disease; MCI), the level of awareness of cognitive functioning varies significantly. A lack of awareness of cognitive functioning may interfere with monitoring of disease progression and opportunities for intervention. Therefore, understanding mechanisms associated with this relationship is critical. Given age-related changes in sleep and known relationships between sleep health and cognition, this pilot tested whether sleep moderates associations between subjective and objective cognition in older adults with MCI.
Methods: Older adults with MCI (N=46, Mage=68.2 years, SD=6.1 years, 33 women) completed one week of sleep diaries [averages of sleep onset latency (SOL), total sleep time (TST), sleep efficiency (SE)], Cognitive Failures Questionnaire (subscores CFQ-memory, CFQ-distractibility, CFQ-blunders), and cognitive tasks [Cambridge Brain Sciences; Polygons (processing speed), Feature Match (attention), Double Trouble (attention/inhibition), Digit Span (working memory)]. Multiple regressions

tested if sleep parameters moderated associations between subjective and objective cognition, covarying for depressive symptoms and number of medical conditions.
Results: SE moderated associations between Polygons and CFQ-blunders (R2-change=.08, p=.03). Specifically, at highest SE, slower processing speed was associated with more blunder complaints (B=-.10, p=.04). Additionally, SE moderated associations between Digit Span and CFQ-distractibility (R2-change=.06, p=.03) and CFQ-blunders (R2-change=.12, p=.004). Specifically, at lowest SE, worse working memory was associated with less distractibility (B=3.01, p=.002) and blunders (B=2.45, p<.001) complaints, while at highest SE worse working memory was associated with more blunder complaints (B=-2.48, p=.04).
Conclusion: Preliminary findings suggest in older adults with MCI, lower sleep efficiency may exacerbate discrepancies between objective and subjective cognition, while higher sleep efficiency may converge this relationship. Sleep efficiency should be considered to fully understand the level of awareness of cognitive functioning in older adults with MCI. Critically, these findings may help identify those at risk of further cognitive decline. While future prospective studies are warranted, present findings suggest a potential next step is to examine whether behavioral treatments for insomnia (e.g., Cognitive Behavioral Therapy for Insomnia, cognitive training) may also change the relationship between objective/subjective cognition.
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0084

DIFFERENTLY WORDED QUESTIONS DO NOT SUBSTANTIALLY INFLUENCE SUBJECT PREDICTIONS OF PERFORMANCE

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Introduction: Being able to accurately predict when one's performance is likely to be impaired by sleep loss can help avoid costly errors. However, the literature is mixed on how accurately individuals are able to make such predictions. Subjective predictions of performance made during total sleep deprivation (TSD) are often only as accurate as judgments of subjective sleepiness, which are poorly correlated. We investigated whether the wording of a question about anticipated performance on a Psychomotor Vigilance Task (PVT) influences the ability to predict actual performance during TSD.
Methods: N=56 healthy adults (ages 25.9±5.3y, 32 females) were randomly assigned to 38h TSD in a 4-day/3-night laboratory study. The PVT and the Karolinska Sleepiness Scale (KSS) were administered approximately every 2-4h during scheduled wakefulness. We created four differently worded questions to elicit ratings of predicted performance on a scale from 1 (worse performance) to 9 (better performance). The questions asked about expected performance at the beginning or end of the PVT, expected duration of good performance, or expected time until impairment. Participants completed the KSS and answered one of the questions (randomly selected), and then performed the PVT. Using separate linear regressions with a fixed effect for rating and a random intercept over participants, we examined whether any of the questions, or the KSS ratings, were better able to predict PVT lapses (RT>500ms). Results were compared using root mean square error (RMSE), a measure of absolute model fit.
Results: Using the predictive accuracy of the KSS as a reference (RMSE=4.71), the RMSE values for the questions ranged from 10.0% lower (RMSE=4.24), indicating slightly better accuracy for predicting subsequent PVT performance, to 13.0% higher (RMSE=5.32), indicating slightly worse accuracy for predicting subsequent PVT performance.
Conclusion: Our results suggest that the wording of a question about anticipated performance on the PVT influences its predictive utility, but with no more than 10% improvement over KSS-rated subjective sleepiness as a performance predictor, the predictive gain was not substantial. This puts into question whether self-predictions of performance, regardless of how they are framed, can be relied upon for assessments of readiness in operational settings.
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0085

DREAM BIZARRENESS IS RELATED TO SPECIFIC ASPECTS OF METACOGNITION THAT ARE INFLUENCED BY PERSONALITY

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Introduction: According to the continuity hypothesis, dreams reflect waking life experiences. Metacognition, the awareness of one's thought processes, is minimal during typical dreaming but is assumed to be greater during lucid dreams, when the dreamer is aware they are dreaming and can sometimes control dream content. Therefore, one hypothesis is that lucid dreams may be more continuous with waking life than non-lucid dreams and thus contain less bizarre content than non-lucid dreams. However, support for this hypothesis is mixed and it may be incomplete, as metacognition typically includes multiple components, including the awareness of thinking and the regulation of processes involved in thinking. Additionally, these various metacognitive aspects may be differentially influenced by personality.
Methods: To further examine how dream bizarreness relates to metacognition, 416 participants completed a survey including measures of dreaming frequency, sleep quality, multiple aspects of metacognition, and the Big 5 personality traits. Participants also reported their most recent lucid and non-lucid dreams which were scored for bizarreness. Relationships between dream bizarreness, metacognition, and personality were subsequently assessed.
Results: Seventy-eight participants were able to report both a lucid and non-lucid dream and contributed to analyses. In contrast to the continuity hypothesis, lucid dreams were more bizarre than non-lucid dreams, and regression analyses revealed that non-lucid dream bizarreness positively predicted awareness of dream dissociation, whereas higher lucid dream bizarreness was associated with fewer negative beliefs about uncontrollability and danger. Finally, higher neuroticism and lower conscientiousness were associated with higher negative beliefs about uncontrollability and danger. No relationships between personality and dream dissociation were present.

Conclusion: The hypothesis that, due to greater metacognitive awareness, lucid dreams are less bizarre than non-lucid dreams, was not supported. Instead, bizarre non-lucid dreams may emerge with increased self-disconnection and bizarre lucid dreams may occur when worry about losing control and associated dangers therein is low. Additionally, due to the observed relationships between personality and metacognition, low neuroticism and high conscientiousness may also increase the bizarreness of lucid dreams. Collectively, these results suggest that dream bizarreness may reflect specific aspects of metacognition rather than a general awareness that one is dreaming.
Support (if any):

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0086

EARLY EVIDENCE FOR DYNAMIC, DAY-TO-DAY ASSOCIATIONS BETWEEN WORKING MEMORY AND SLEEP IN PRE-ADOLESCENT YOUTH

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Introduction: The transition to adolescence is marked by critical shifts in sleep, including increased variability as well as delayed bedtimes, reduced total sleep time (TST), and reduced homeostatic sleep pressure. Sleep supports healthy brain development, and insufficient sleep impairs brain development in children and adolescents. Short-term experimental manipulations of sleep disturbance and deprivation in adults leads to dysfunction in declarative and working memory. The few experimental studies in youth suggest their cognitive abilities may be more resilient to sleep loss, but these typically include only one night of sleep manipulation. Here, we examined this phenomenon across a week of data.
Methods: Data was used from eleven 9- to 13-year-olds (M = 12.52, SD = 1.4, F = 5) in an ongoing measurement burst longitudinal study spanning one year. For seven consecutive days, participants completed daily sleep diaries, and the working memory task, the O-SPAN, which consists of remembering letters intermixed with math equations. Multilevel models which adjusted for age and sex were used to examine the bidirectional associations between sleep and cognitive performance at the between and within-subjects levels.
Results: Within-subjects (daily) variation in sleep duration, relative to each child's typical sleep duration, was related to better working memory performance at trending significance. Within-subjects (daily) variation in working memory, relative to each child's typical working memory performance, was related to significantly longer sleep duration. There are currently no statistically significant associations at the between-subjects level.
Conclusion: Our preliminary results suggest there are within-person, dynamic fluctuations in sleep duration and working memory in adolescents. On nights when adolescents sleep better, their working memory improves (and vice versa). Our ongoing day-to-day investigation of the role of sleep on cognition (target N=60) provides insight into the nuanced role sleep plays, especially along the performance spectrum. Future analyses in this ongoing study will evaluate dependencies in the data structure across the week, as well as developmental trends in sleep-memory associations. The current results are novel and suggest longitudinal methods are critical in the analysis of sleep and cognition in development.
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0087

EFFECTS OF A DUAL OREXIN RECEPTOR ANTAGONIST ON ANXIETY-LIKE BEHAVIOR AND COGNITION IN A MOUSE MODEL OF TBI

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Introduction: Mild/moderate traumatic brain injuries (TBIs) often occur in the frontal cortex and can induce prolonged impairments in sleep, cognition, and anxiety. Orexin is a neuropeptide that activates two receptors that stimulate monoamine activation in the brain to induce wakefulness. We aimed to determine if a dual orexin receptor antagonist (DORA) could improve prolonged cognitive impairments in mice that received TBI.
Methods: Two-month-old male and female C57BL/6J mice were randomly assigned to treatment groups. Mice received a craniectomy and TBI in the frontal cortex by controlled cortical impact, a craniectomy only (sham), or neither. Mice received a vehicle (placebo) or DORA by gavage for 2 consecutive days 24 h, 2 wks, and 1 m after the TBI or control treatments. Two-months after the TBI or control procedures, the mice were subjected to the open field and novel object familiarization. The following day, mice were administered the vehicle or DORA, and subjected to the elevated-plus maze (EPM), open-field maze, and novel object recognition (NOR) test. Significance was set at $p<.05$.
Results: No significant difference between the control and sham treatments were overserved in NOR. Time spent exploring the novel object vs. the familiar object was significantly increased in both control and sham groups that received the vehicle indicating intact cognition ($p=0.001$ and $p=0.0001$, respectively). However, TBI reduced time spent exploring the novel object under vehicle conditions and after DORA treatments without TBI resulting in no significant differences in novel vs. familiar object exploration. The combined DORA and TBI treatment group spent significantly greater time exploring the novel object ($p=0.047$), although exhibited significantly less movement duration compared to other controls (Sham Vehicle $p=<.0001$; Control Vehicle $p=<.0001$). No significant differences in the EPM or open-field maze were found with experimental treatments.
Conclusion: These data further implicate mild/moderate TBI in impairments in cognition. However, due to the increased immobility caused by the DORA, we cannot conclude an interaction of DORA treatment with TBI on cognition using a NOR test that is dependent on movement activity.
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0088

SLEEP STRUCTURE AND HEAT DISSIPATION INFLUENCE SUBJECTIVE SLEEP ONSET LATENCY IN YOUNG ADULT HUMAN SUBJECTS

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Introduction: Several previous studies reported that humans can estimate the time that has elapsed during sleep (time estimation ability; TEA). Although research on the TEA during sleep has advanced in the field of sleep research, few studies have focused on the relationship between the subjective sleep onset latency (SOL), which is an indicator of TEA, and objective sleep structures, heat dissipation, and body temperature. The current study examined the relationship between subjective SOL, sleep structure, changes in skin and body temperature, and subjective evaluation of sleep in healthy young adults to elucidate the pathophysiological mechanisms of insomnia.

Methods: Twenty-eight subjects (7 men and 21 women, mean age: 21.54 ± 0.50 years) with no sleep problems participated in a 1-hour polysomnographic recording that obtained objective sleep parameters during the daytime while skin and body temperatures were recorded. The distal–proximal skin temperature gradient (DPG) was calculated. The duration of stage W, stage N1, stage N2, and stage N3 and stage R sleep, sleep latency, wake after sleep onset, total sleep time were calculated for all PSG recordings. Power spectral analysis using the fast Fourier transform algorithm was conducted. Also, subjective parameters, such as subjective SOL, sleep time, and restorative sleepiness, were evaluated before and after sleep. The study was approved by the Ethics Committee of Saitama Prefectural University.

Results: Almost all subjects estimated their sleep latency as being longer than their actual SOL (13.70 min vs. 7.57 min). Objective SOL was significantly correlated with each sleep stage parameter whereas subjective SOL was negatively correlated with stage N2 sleep duration, slow-wave activity and δ-power, and ΔDPG (the degree of reduction of heat dissipation before and after lights-off). Stepwise regression analysis showed that ΔDPG was the strongest predictive factor in explaining the length of subjective SOL.

Conclusion: The degree of heat dissipation before and after lights-off contributed most to the sensation of falling asleep in healthy young adults, and stage N2 duration and slow wave components immediately after falling asleep may be related to the sensation of falling asleep. This finding may be helpful for elucidating the physiological mechanisms of insomnia and its treatment.

Support (if any):

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0089

EXAMINATION OF POST-AROUSAL HYPERSYNCHRONY IN THE FIRST-NIGHT EFFECT

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Introduction: The first-night effect (FNE) is a sleep disturbance caused by sleeping in a new environment. FNE observed on polysomnography includes increased wakefulness and sleep instability. Post-arousal hypersynchrony (PAH) is an arousal subtype with a post-arousal delta wave burst that antagonizes arousal and maintains sleep (Suzuki et al., 2021). Furthermore, we have shown that PAH correlates with the number of arousals; increased arousals increases PAH. Therefore, we hypothesized that the FNE would increase arousal and PAH.
Methods: Fifteen healthy adults (five women, mean ± standard deviation 21.7 ± 1.6 years) undergoing first-time polysomnography were included. After three days of sleep-wake cycle control before measurement, four nights of polysomnography were performed in the laboratory. A registered polysomnographic technologist blindly scored the participants' sleep stages and analyzed PAH. Linear mixed models and non-parametric tests were performed on sleep variables and PAH for changes from the first to fourth measurement night.
Results: Sleep variables did not change significantly with the number of measurements. Contrary to our hypothesis, there was no FNE on the number of arousals. The number of PAH had a significant main effect on the number of measurements, showing a significant decrease on the fourth night compared to the first night.
Conclusion: Sleep variables, including arousal, were not affected by the FNE, whereas PAH was. The lack of a FNE on the sleep variables may be due to a ceiling effect caused by sleep in young healthy adults. Since the number of arousals showed no changes, the FNE of PAH could not be explained regarding inhibition on arousal, such as a role in sleep maintenance. The decreased number of PAH sleep measurements may indicate sleep stabilization.
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0090

IMPACT OF EVENING BINGE ALCOHOL CONSUMPTION ON NOCTURNAL HEART RATE RESPONSE TO CORTICAL AROUSAL

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Introduction: Chronic alcohol consumption increases the risk of cardiovascular disease. While acute alcohol intake increases heart rate (HR), the impact of alcohol on HR responses to nocturnal arousals remains unclear. The present study investigated the effect of evening binge alcohol consumption on HR responsiveness to nocturnal cortical arousals. We hypothesized that alcohol intake would lead to an exaggerated HR reactivity to cortical arousals throughout the sleep period.
Methods: Fifteen healthy adults (6 male, 9 female; 27±2 yrs; 28±1 kg/m^2) participated in this study. Using a randomized cross-over design, participants underwent two testing conditions (i.e., alcohol vs fluid control) separated by one month. In the alcohol condition, participants consumed the equivalent of 4-5 drinks in the span of two hours prior to sleep. A volume matched fluid-control was utilized for the control condition. The alcohol dose was based on the NIAAA definition of binge drinking (i.e., 1g/kg men, 0.85 g/kg women). Overnight polysomnography (PSG) with continuous electrocardiogram (ECG) was utilized over the course of an 8-hour in laboratory sleep period to quantify sleep, arousals, and nocturnal HR. Arousals were only included if they were not associated with any respiratory events, limb movements, or awakenings. HR responses following spontaneous nocturnal cortical arousals were collected and analyzed across 20 cardiac cycles.
Results: A main effect of experimental condition was observed whereby alcohol consumption resulted in a significantly elevated heart rate (Fluid Control: 64±2 vs. Alcohol: 72±3 beats/min, $p< 0.001$). There was no main effect of condition on HR reactivity (Placebo: Δ1.7±1, Alcohol: Δ2.1±1 beats/min, $p=0.545$). A significant condition x time effect was observed when assessing both raw HR ($p=0.005$) and HR reactivity ($p=0.005$). In contrast to our initial hypothesis, HR reactivity during the early phase of the arousal response was reduced in the alcohol condition at cardiac cycles 2, 3, and 4 (all $p< 0.05$) following nocturnal arousal occurrence.
Conclusion: These findings indicate that evening alcohol intake increases nocturnal HR, leading to a blunted HR response to cortical arousals. The sustained effect of alcohol on nocturnal HR may contribute to cardiovascular risks associated with evening binge alcohol consumption.
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0091

INFLUENCE OF EVENING ALCOHOL INTAKE ON NOCTURNAL HEART RATE

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Introduction: Binge alcohol consumption has detrimental effects on cardiovascular health and sleep. The simultaneous influence on sleep and cardiovascular measures may lead to an adverse nocturnal cardiac profile. The aim of the present study was to examine the impact of evening alcohol consumption on nocturnal heart rate (HR) patterns. We hypothesized that alcohol intake would result in a sustained increase in HR throughout the night and reduced HR dipping relative to pre-sleep wakefulness.
Methods: In a randomized crossover design, ten participants (5 male, 5 female; 26±2 yrs; 28±1 kg/m2) underwent a night of binge alcohol consumption and a fluid control separated by one month. Sleep and nocturnal HR were measured using continuous overnight polysomnography and electrocardiogram. HR was averaged across 15-minute intervals over the 8-hour sleep period.
Results: Consistent with our initial hypothesis, a condition effect was observed whereby average raw HR was increased following alcohol consumption (Fluid Control: 60±3 vs. Alcohol: 66±3 beats/min, $p=0.003$). This condition effect was absent when examining average change in HR relative to a 15-minute

wakefulness period (Fluid Control: Δ-2.3±0.6 vs. Alcohol: Δ-2.7±1.1 beats/min change, p=0.75). A condition x time effect was present in both average raw HR (p=0.003) and relative HR change from wakefulness (p=0.01). Contrary to our hypothesis, post hoc analyses revealed that the alcohol condition demonstrated augmented relative HR dipping 15 (Fluid Control: Δ-3.2±0.6 vs. Alcohol: Δ-4.8±0.8 beats/min) and 30 minutes (Fluid Control: Δ-3.1±1.1 vs. Alcohol: Δ-6.0±1.0 beats/min) after lights out. However, a substantial increase in relative HR was observed in the alcohol condition when compared to the control 210 (Fluid Control: Δ-3.1±0.8 vs. Alcohol: Δ1.1±1.0 beats/min) and 225 minutes (Fluid Control: Δ-3.6±0.6 vs. Alcohol: Δ1.6±1.5 beats/min) after lights out.

Conclusion: Evening binge alcohol consumption increased HR throughout the sleep period. The overnight profile demonstrated that alcohol elicited a steeper decline in nocturnal HR immediately after lights out, but a significant augmentation of HR during the later portion of the night. The observed elevation in overall HR and further relative increase in the second half of the night may contribute to cardiovascular risk following alcohol intake.

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0092

INFLUENCE OF EVENING ALCOHOL CONSUMPTION ON NOCTURNAL CARDIAC REACTIVITY DURING NREM VS REM SLEEP

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Introduction: Chronic alcohol consumption disrupts sleep, especially rapid eye movement (REM). However, the impact of alcohol on nocturnal cardiovascular responses to cortical arousal during non-REM (NREM) and REM sleep remains unknown. This present study investigated the impact of evening binge alcohol on heart rate (HR) reactivity following nocturnal cortical arousals in NREM vs. REM sleep. We hypothesized that alcohol intake would lead to increased HR responsiveness following cortical arousals in both sleep stages.

Methods: Fifteen healthy adults (6 male, 9 female; 27±2 yrs.; 28±1 kg/m2) underwent two testing conditions (i.e., alcohol vs fluid control) separated by one month in a randomized crossover design. In the alcohol condition, a dosage of 4-5 drinks, two hours before bed was given based off the NIAAA definition of binge drinking (i.e., 1g/kg men, 0.85 g/kg women). In the control condition, a volume matched fluid-control was used. Overnight polysomnography with continuous electrocardiogram was used to quantify sleep, arousals, and nocturnal HR following each condition. HR responses were characterized for 20 cardiac cycles following spontaneous cortical arousals.

Results: Absolute HR was elevated following binge alcohol consumption in both REM (Placebo: 65±2 vs. Alcohol: 73±3 beats/min, p< 0.001) and NREM (Placebo: 64±2 vs. Alcohol: 71±3 beats/min, p< 0.001) sleep. In NREM there was a significant condition x time effect in HR reactivity (p< 0.001). NREM early phase HR arousal responsiveness was blunted in cardiac cycles 2,3, and 4 (all p< 0.05) following alcohol consumption, but HR remained elevated in the latter half at cardiac cycle 15 (Placebo: Δ-0.9±1.0 vs. Alcohol: Δ0.9±0.7 beats/min, P=0.038). There was no condition (P=0.916) or condition x time interaction effect (P=0.999) on HR reactivity during REM sleep.

Conclusion: The present study observed an increase in absolute HR in both REM and NREM sleep following evening alcohol intake. However, alcohol has differential effects on HR reactivity to arousal during REM and NREM sleep, whereby the initial HR response to cortical arousals is blunted, but the recovery response is augmented during NREM sleep. These findings point to a stage-specific effect of evening binge alcohol consumption on nocturnal cardiac reactivity to naturally occurring arousals.

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0093

ACUTE EFFECTS OF DIAPHRAGMATIC BREATHING ON CIRCULATORY DYNAMICS AND AUTONOMIC FUNCTION DURING SLEEP IN YOUNG MEN

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Introduction: Increased arterial stiffness during rest and blood pressure (BP) during sleep are independent risk factors for cardiovascular disease (Boutouyrie et al.2021, Kario et al.2019). Slow, deep breathing is a useful nonpharmacological intervention to control hypertension (Chang et al.2013). However, the acute effects of diaphragmatic breathing before sleep on arterial stiffness during rest and BP during sleep are unknown. In this study, we investigated the acute effects of diaphragmatic breathing before sleep on arterial stiffness, BP, and cardiac autonomic function in young men.

Methods: Fifteen healthy young men (age: 20.0 ± 0 years, Height: 170 ± 5 cm, Weight: 56 ± 3 kg) participated in this study and underwent two separate sessions in a randomized controlled crossover design: 4-4-8 breathing (BT) protocol (12 consecutive breaths of 4 seconds of inhalation, 4 seconds of pause, and 8 seconds of exhalation through the nose) and control (CON) without 4-4-8 breathing. Brachial-ankle pulse wave velocity (PWV) reflected systemic arterial stiffness and carotid-femoral PWV reflecting central (aortic) arterial stiffness measured using an automated pulse wave testing device. BP was measured simultaneously using an automated oscillometric device. Autonomic function was measured from high-frequency (HF) and low-frequency (LF) components by HR variability spectral analysis. Arterial stiffness, BP, HF, and LF were measured before (baseline) and 30 and 60 min and 24 hours after the 4-4-8 breathing technique. BP, HF, and LF were measured while sleeping.

Results: There was a significant decrease in the baPWV and LF at 30 min after the BT trial compared to baseline values (P< 0.05). cfPWV on both trials was unchanged. There was a significant increase in the HF at 30 min after the BT trial compared to baseline values (P< 0.05). BP and LF during sleep were lower in the BT trial than in the CON trial (P< 0.05). HF during sleep was higher in the BT trial than in the CON trial (P< 0.05).

Conclusion: A novel finding of this study is that practicing slow, diaphragmatic breathing with relatively long exhalation times may reduce arterial stiffness during rest and BP during sleep through activation of the parasympathetic nervous system.

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0094

HABITUAL SLEEP AND AUTONOMIC FUNCTION IN HUMANS

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Introduction: Insufficient habitual sleep duration and efficiency are commonly experienced in modern society and are associated with cardiovascular disease development. A potential mediator of this relationship may be impairment in cardiovascular regulation via the autonomic nervous system. The purpose of the present study was to assess the relationships between habitual total sleep time (TST), sleep efficiency (SE), muscle sympathetic nerve activity (MSNA), and heart rate variability (HRV) in a robust sample of healthy adults. We hypothesized that shorter TST would be associated with increased sympathetic and decreased parasympathetic activity.
Methods: A minimum 7 days of at-home, objective actigraphy sleep monitoring was collected in 75 healthy young adults (39 males, 36 females; 24±1 years; 25±1 kg/m2). In each participant, three seated sphygmomanometer recordings were used to determine resting mean arterial blood pressure (MAP). Prior to laboratory testing, participants were asked to refrain from caffeine and exercise for 12 hours, and alcohol for 24 hours. All participants underwent an autonomic function test that simultaneously assessed heart rate (HR, electrocardiogram), beat-to-beat blood pressure (finger plethysmography) and MSNA (microneurography) during 10 minutes of quiet rest. R-R intervals were used to quantify both time (i.e., RMSSD and pNN50) and frequency (high-frequency heart rate variability; HF-HRV) domain HRV parameters. RMSSD and HF-HRV were log-transformed due to non-normal distributions.
Results: Contrary to our hypothesis, habitual TST was not associated with resting MAP (R=0.173, P=0.137), HR (R=-0.137, P=0.241), MSNA (R=-0.186, P = 0.110), RMSSDlog10 (R=0.085, P=0.468), pNN50 (R=0.043, P=0.711), or HF-HRVlog10 (R=0.019, P=0.869). Similarly, SE was not associated with resting MAP (R=0.112, P=0.339), HR (R=-.037, P=0.751), MSNA (R=-0.033, P = 0.778), RMSSDlog10 (R=-0.006, P=0.956), pNN50 (R= -0.003, P=0.983), or HF-HRV (R=-0.028, P=0.810).
Conclusion: Our findings do not support a relationship between habitual TST or SE and measures of autonomic nervous system activity in healthy adults. However, a more pronounced effect may be observed in populations with established sleep disorders such as insomnia and obstructive sleep apnea. Further research is necessary to establish the independent effect of objective sleep quantity and quality on autonomic control in these populations.
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0095

FAT INTAKE MODIFIES THE ASSOCIATION BETWEEN SLEEP DEPTH AND CARDIAC AUTONOMIC MODULATION IN ADOLESCENTS

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Introduction: Prior data shows an association between the odds ratio product (ORP), a continuous EEG measure of sleep depth, with heart rate variability (HRV), a continuous EKG measure of cardiac autonomic modulation. Nutritional lifestyle choices can impact cardiac health, with densely-caloric diets or those with greater percentage of specific macronutrients being associated with adverse cardiac outcomes. Adolescence, a developmental period marked by physical changes, is also marked by changes in sleep depth and dietary intake. We examined whether the association between ORP and HRV is more adverse in adolescents with inadequate nutritional intake.
Methods: We studied 293 adolescents (median 16y) from the Penn State Child Cohort. We extracted ORP during NREM sleep from 9-hour, in-lab polysomnography (PSG), and low-frequency (LF), high-frequency (HF) and time-domain [e.g., root mean square standard deviation (RMSSD)] HRV indices from 24-h Holter EKG monitoring immediately following PSG. Linear regression analyses examined the association between ORP, and its interaction with nutritional intake (total-calories, protein, total-fat, and carbohydrates), with 24-h HRV indices while adjusting for sex, age, race/ethnicity, obesity, metabolic syndrome, PSG-measured sleep apnea, insomnia symptoms, and actigraphy-measured sleep duration.
Results: The interactions between ORP and total-fat intake on LF, HF and RMSSD were statistically significant ($p< 0.05$), while the interactions between ORP and total-calories ($p< 0.10$), proteins ($p< 0.10$) or carbohydrates ($p>0.10$) on HRV indices were not statistically significant. Among adolescents with high total-fat intake (≥ 60 gm; n=161), each standard deviation increase in ORP was associated with a -0.1 (0.04) log-Hz, -0.2 (0.07) log-Hz, and -4.3 (1.8) ms decrease in LF ($p< 0.001$), HF ($p=0.009$) and RMSSD ($p=0.02$), respectively, while this association was not significant among adolescents with low total-fat intake (< 60 gm; n=162; β=-0.01, SE=0.04, $p=0.846$; β=0.1, SE=0.07, $p=0.348$; and β=1.7, SE=2.1, $p=0.403$, respectively).
Conclusion: Adolescents who follow high-fat diets are more vulnerable to the impact of shallow sleep on impaired cardiac autonomic balance, making them a targeted group for preventative sleep and cardiovascular strategies.
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0096

SIMULATED NIGHT SHIFT SCHEDULE ALTERS ENDOGENOUS TEMPORAL REGULATION OF GLUCOSE AND INSULIN

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Introduction: Shift workers experience misalignment between internally-driven circadian rhythms and externally-driven

behavioral schedules. Mounting evidence from hormone-, cytokine-, exosome-, proteome-, and metabolome-based biomarker analyses of blood samples predicts disruption of glucose and insulin regulatory pathways during night shift schedules. Here, we quantified circulating glucose and insulin concentrations in a constant routine (CR) protocol to assess functional metabolic outcomes of prior simulated shift work.

Methods: Healthy adults (N=14; aged 22–34; 4 females) completed a 7-day/6-night in-laboratory study, with randomization to either a 3-day simulated day shift (DS) schedule (n=7) with nighttime sleep (22:00–06:00) and 3 daytime meals (07:30, 13:00, 19:30), or a 3-day simulated night shift (NS) schedule (n=7) with daytime sleep (10:00–18:00) and 3 nighttime meals (19:30, 01:00, 07:30). A 24h CR protocol followed, during which participants stayed awake under constant behavioral and environmental conditions, including hourly isocaloric snacks. Serum collected via intravenous catheter every 6h during the CR was assayed using glucose colorimetric detection and human insulin ELISA. Glucose and insulin concentrations were analyzed with mixed-effects ANOVAs with fixed effects of prior simulated shift condition (day, night) and sampling time (01:30, 07:30, 13:30, 19:30) and their interaction, with a random effect over participants on the intercept. Mixed-effects cosinor regression analyses were conducted to compare endogenous circadian rhythms between conditions.

Results: For glucose, there was a significant condition*time interaction ($F[3,30]=4.99$, $P=0.006$), with a 9.34±2.42h delay (mean±SE) of the endogenous circadian glucose rhythm after simulated NS compared to DS ($t[12]=3.85$, $P=0.002$). For insulin, there were significant effects of condition ($F[1,30]=5.93$, $P=0.021$) and time ($F[3,30]=3.01$, $P=0.046$), with no significant endogenous rhythmicity after simulated DS, but the appearance of a circadian rhythm with reduced insulin concentrations after simulated NS ($t[12]=-3.32$, $P=0.006$).

Conclusion: Under constant routine, we found altered endogenous temporal patterns of glucose and insulin after just 3 days of simulated NS compared to DS. Our results indicate that biomarker and omics-based predictions of disrupted glucose and insulin regulatory pathways have functional significance evident in circulating glucose and insulin concentrations. This may explain the insulin resistance and increased risk of metabolic disorders observed in shift workers.

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0097

CARDIOVASCULAR EFFECTS OF LONG-TERM SLEEP FRAGMENTATION IN MICE

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Introduction: Sleep Fragmentation (SF) is a prevalent phenomenon and also a pathognomonic feature of obstructive sleep apnea (OSA). SF is associated with OSA-related morbidities. However, it remains unclear whether prolonged SF exposures contribute to the development of specific cardiovascular morbidities in OSA. In this study, we postulate that chronic SF may induce structural and functional changes in the cardiac and vascular systems.

Methods: Male C57Bl/6J mice (n=8) were housed in custom-designed cages with a near-silent motorized mechanical sweeper crossing the cage in 2-min intervals or sleep control (SC, sweeper inactive) for 12 hours during the light period for 12 weeks. Mean arterial blood pressure (MBP) was assessed using tail-cuff method, while aortic peak velocity (indicator of systolic function), E/A ratio (indicator of diastolic function), coronary flow velocity reserve (CFVR), and pulse wave velocity (PWV) were assessed using Doppler Flow Velocity System. Then, left anterior descending coronary arteries and thoracic aorta were excised, mounted on wire myographs, and used to obtain endothelium-dependent relaxation dose-response curves to acetylcholine (ACh)

Results: MBP was significantly elevated in SF mice (107 ± 7 mmHg) after 12 weeks when compared to SC (89 ± 5 mmHg, $p < 0.0001$). Systolic and diastolic function, and CFVR were not affected by the 12 weeks of SF exposure. However, SF mice had higher PWV (4.3 ± 0.6 mm/msec) when compared to SC mice (3.1 ± 0.2 mm/msec). Coronary maximal ACh-induced vasodilation was impaired in SF mice (67 ± 9%) when compared to SC (86 ± 5%, $p < 0.001$). Aortic maximal ACh-induced vasodilation was not affected by 12 weeks of SF.

Conclusion: long-term SF, a hallmark characteristic of OSA, promotes cardiovascular perturbations including coronary artery dysfunction and arterial stiffness, thereby supporting a role for sleep fragmentation in the cardiovascular morbidity of OSA.

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0098

CHRONIC SLEEP RESTRICTION RESULTS IN ABNORMAL BONE DEVELOPMENT IN ADOLESCENT RATS

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Introduction: Adolescence is often plagued by years of inadequate sleep at a time when nearly half of the adult skeletal mass is accrued and peak bone mass is attained. Previously we reported that chronic sleep restriction (SR) in adult male rats causes strikingly abnormal bone health. The purpose of this study was to test our hypothesis that SR results in abnormal bone development.

Methods: Chronic SR in juvenile rats from 42–60 d of age was produced by a validated modification of the Bergmann-Rechtschaffen paradigm with ambulation controls (AC). For five-day periods, sleep time was protected for 4 hours/day to model late bedtimes and early awakenings on schooldays, with a 35% sleep reduction for the rest of the time. Between five-day SR periods, sleep was undisturbed for 48 hours to model weekend catch-up sleep. Harvested femurs were studied for bone integrity by biomechanical testing (males and females, SR vs AC, N=3-4/sex/grp) and bone quality by micro-CT (male SR vs AC, N=4/grp). To investigate recovery, other male rats were studied at 90 and 120 d of age (N=5-6/grp) after chronic SR during 42–60 d of age.

Results: Chronic SR resulted in weak femurs, indicated by a 21% decrease in work to failure by three-point bending [N=7-8/grp pooled sexes, SR: 57 (SD 14); AC: 72 (SD 13) mJ, $P< 0.02$)]. By sex, there was a 23% decreased work to failure in male SR

juveniles (P< 0.03) and a nonsignificant 17% decrease in female SR juveniles vs AC, but no differences in fat or lean body mass, leg muscle masses or femoral length. Trabeculae were decreased in number [SR vs AC, 1.9 (SD 0.4) and 2.4 (SD 0.4) /mm, P< 0.05] with increased spacing [SR vs AC, 552 (SD 122) and 419 (SD 66) µm, P=0.05]. In post-SR rats aged to 90 and 120 d, femoral work to failure was decreased by >44% (P< 0.004, P< 0.03 respectively).
Conclusion: Chronic SR during adolescence results in abnormal bone development with deficits that persist into adulthood. Failure to achieve peak bone mass or maintain bone in adolescence is known to significantly affect the progression to osteopenia/osteoporosis in later life.
Support (if any):

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0099

IMPACT OF SLEEP AND TIMING OF VACCINATION ON NEUTRALIZING ANTIBODY RESPONSES TO THE COVID-19 VACCINE

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Introduction: Vaccines remain the primary mitigating strategy to reduce the burden of disease caused by COVID-19. As such, there is a pressing need to identify factors that promote more robust and durable immune responses to vaccination. Sleep and circadian processes, such as the timing of vaccine administration, have been hypothesized to play a meaningful role in predicting durability of antibody responses; however, empirical data supporting links between sleep and timing on COVID-19 vaccine response is limited.
Methods: We recruited 428 adults (aged 18-88 years old) naive to the COVID-19 vaccination series and SARS-CoV-2 infection who received the mRNA COVID-19 vaccine series (% Pfizer; % Moderna) and underwent blood draws to quantify neutralizing antibody responses (nAB) 1 and 6 months post vaccination series. They completed sleep questionnaires (Pittsburgh Sleep Quality Index) and a week of sleep diaries at three time points. In addition, 198 participants wore a wearable device (Oura Ring) for 2 months to capture behavioral sleep metrics. Time of day of vaccine was obtained by self-report as part of the daily diaries.
Results: Analyses revealed that independent of age, sex, BMI, smoking status, and vaccine type, poorer global sleep quality was associated with lower nABs 6-months post vaccination (F(1, 424.3)=5.30, p=0.02). We also did detected a trend-level 3-way interaction between vaccine type, time point, and OURA based sleep duration indicating that shorter sleep duration was associated with lower 6-month nAB in those who received the Pfizer vaccine (b=0.17, SE=0.07, p=0.009). In analyses examining the impact of time of day of vaccine administration on nABs, we failed to find any evidence that timing of vaccine administration was associated with nABs at 1 or 6 months post vaccination (Dose 1: F(1, 330.1)=0.01, p=0.91; Dose 2: F(1, 344.5)=0.46, p=0.50).
Conclusion: Findings suggest that better global sleep quality is associated with greater nAB durability to the COVID-19 vaccine, and among those who received the Pfizer vaccine, longer average sleep duration promoted higher nAB 6-months post-vaccination. However, there was no clear evidence indicating that timing of vaccination administration was relevant to nAB responses. Further research is warranted including investigations into whether sleep interventions can enhance vaccine efficacy.
Support (if any): R24AG048024

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0100

EXCRETION OF THE DUAL OREXIN RECEPTOR ANTAGONIST DARIDOREXANT INTO BREAST MILK OF HEALTHY LACTATING WOMEN

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Introduction: Daridorexant is a dual orexin receptor antagonist approved for the treatment of adult patients with insomnia. Following single-dose administration to healthy lactating female subjects, pharmacokinetics (PK) of daridorexant and its major metabolites were assessed in breast milk and plasma.
Methods: A single oral dose of 50 mg daridorexant was administered in the morning to 10 healthy lactating subjects (fasted state). To evaluate the transfer of daridorexant and its major metabolites into breast milk, all secreted breast milk over 72 h post dose as well as several plasma samples were collected. The PK of daridorexant in milk and plasma were assessed including the cumulative amount and fraction of dose excreted, estimation of the daily infant dose, and the relative, i.e., weight-adjusted infant dose that would be consumed by the breastfed child. Safety and tolerability were also investigated.
Results: All 10 subjects completed the study and were evaluable for PK and safety. Daridorexant was rapidly absorbed and distributed from plasma. Parent daridorexant and its major metabolites could be quantified in breast milk of all subjects. The shape of the individual milk concentration-time profiles of daridorexant closely followed the corresponding plasma profiles, and area under the curve and peak concentrations in breast milk were approximately 45- and 50-fold lower than in plasma. The cumulative total amount of daridorexant excreted over 72 h was 0.010 mg, which corresponds to 0.02% of the maternal dose. Overall, a mean daily infant dose of 0.009 mg/day and a relative infant dose of less than 0.22% over 24 h were determined. The known safety profile of daridorexant was confirmed. Headache was the most frequently reported adverse event (4 subjects).
Conclusion: Daridorexant was safe and well tolerated in healthy lactating women and presence of daridorexant and its major metabolites in breast milk is very low. However, despite the minimal excretion of daridorexant into breastmilk, a risk of somnolence to the breastfed infant cannot be excluded.
Support (if any): At time of study conduct, Priska Kaufmann, Marion Anliker-Ort, Clemens Muehlan, and Jasper Dingemanse were employees of Idorsia Pharmaceuticals Ltd (sponsor). Nicholas Siebers was the Principal Investigator at Labcorp.

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0101

EFFECTS OF COMBINED HAND AND FOOT BATHING ON HEAT DISSIPATION, DAYTIME SLEEP STRUCTURE, AND GENDER DIFFERENCE

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Introduction: Recent reports have highlighted the usefulness of partial body bathing, such as foot bathing, in nursing care and caregiving. However, many studies have focused on subjective evaluations; limited attention has been given to the objective evaluation and underlying mechanisms of these bathing practices. In this study, we investigated the relationships among heat dissipation due to combined hand and foot warm bathing, changes in body temperature, and objective sleep structures and examined potential sex-related differences in these parameters among healthy subjects. This study was approved by the Ethical Committee of Saitama Prefectural University.
Methods: Thirty healthy adults (14 men, 16 women; mean age, 21.47 ± 1.50 years) participated in a 2-day experiment involving a baseline condition (35ºC) and warm bath condition (40ºC) using a crossover design. Under each condition, the participants took a 15-minute hand and foot bath during the day, followed by 1-hour daytime polysomnography. We measured distal skin temperatures (hands and feet) and proximal skin temperatures (subclavian region and forehead) to determine the distal–proximal skin temperature gradient (DPG). We also measured the core body temperature. A registered polysomnographic technologist scored the sleep stages in 30-second epoch periods according to the Scoring Manual of the American Academy of Sleep Medicine.
Results: The DPG during bathing, after bathing, and during sleep was significantly higher in the warm bath than baseline condition. In addition, the duration of slow-wave sleep was longer in the warm bath condition, especially at 20 to 40 minutes after bedtime. With respect to sex-related differences, the DPG during the sleep period was significantly higher and the duration of slow-wave sleep in the warm bath condition was significantly longer in women than in men. There was no significant difference in the DPG between the baseline and warm bath conditions in men.
Conclusion: A 15-minute combined hand and foot warm bath promoted heat dissipation and increased the duration of slow-wave sleep. Heat dissipation was accelerated only in women, suggesting sex-related differences in heat dissipation during sleep, even under partial bathing conditions. In future research, we will examine the factors contributing to the sex-related differences found in this study.
Support (if any):

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0102

EFFECTS OF DAYTIME AMBIENT TEMPERATURE ON ACTIGRAPHY-DERIVED SLEEP PARAMETERS IN MEN AND WOMEN

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Introduction: Evening and nocturnal exposure to cold and warm temperature can respectively blunt or enhance vasodilation needed to initiate sleep. However, the effects of temperature exposure several hours prior to bedtime on sleep have not been well studied. We examined the impact of colder and warmer daytime temperatures on nighttime sleep in men and women.
Methods: In a 7 to 13-day inpatient study (NCT01568671), the metabolism of twelve men (23.2 ± 4.9 yrs; 23.4 ± 1.6 kg/m2) and fifteen women (25.5 ± 4.0 yrs; 22.1 ± 2.2 kg/m2) was measured in a room calorimeter during exposure to a randomly assigned temperature between 16-31˚C from 0800-1300 each day while wearing standardized clothing. Thereafter, ambient temperature was controlled at a thermal neutral temperature (23-25˚C), including during nighttime sleep. Diet and physical activity each day were also standardized. Sleep parameters were assessed using the wrist actigraphy on the non-dominant hand (ActiGraph wGT3X-BT; 80Hz) and compared amongst thermal neutral (24.3 ± 0.4˚C), coldest (19.1 ± 1.2˚C), and warmest (30.4 ± 0.7˚C) daytime temperatures. Whole-body thermal insulation was calculated as the inverse of the slope of metabolism versus ambient temperature below the thermal neutral zone. Linear mixed effects models were used to predict each sleep parameter with sex and temperature as fixed effects and each subject as a random effect.
Results: Over all temperatures, women spent longer time in bed (460.1 ± 58.6 vs. 405.1 ± 68.9 min, p=0.01) and slept longer (427.3 ± 54.1 vs. 372.3 ± 62.0 min p=0.007). No significant interaction was observed between sex and temperature for the sleep parameters. Sleep efficiency after cold exposure was significantly correlated with insulation (R=0.45, p=0.03), which was greater for women than men (0.38 ± 0.04 vs. 0.34 ± 0.04°C/W/m2, p< 0.04). No differences in sleep parameters were observed after warm exposure.
Conclusion: Our findings suggest that daytime cold exposure may influence nocturnal sleep in a relationship mediated by individual thermal insulation. Future studies will need to assess sleep architecture and skin and core temperature regulations of men and women in response to daytime ambient temperature.
Support (if any):

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0103

DAILY ASSOCIATIONS BETWEEN RELATIONSHIP STRESS AND SLEEP HEALTH IN YOUNG ADULTS

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Introduction: Stress in interpersonal relationships has been related to adverse mental health outcomes, however, fewer studies have examined associations with physical health, particularly sleep. To date, most studies rely on retrospective reports of stress and sleep measured at a single timepoint, and do not examine multiple types of relationship stress. We tested whether daily stress with family, partner/spouse, and/or friends predicted shorter total sleep time (TST), lower sleep efficiency (SE), and/or later sleep midpoint via ecological momentary assessment (EMA) among young adults.

Methods: Participants were 293 young adults (21-30 y/o; 64% female; 5% Asian, 25% Black, 5% Biracial or Multiracial, 1% Other race, 64% White) reporting regular alcohol use from two studies with a shared assessment battery and up to 18-day EMA protocol. Participants reported daily sleep (TST [hours], SE, and midpoint, calculated from sleep diary reports), cannabis use (yes/no), alcohol use (total number of drinks), and stress with family, spouse/partner, and friends (coded as: 0=not at all, 1=somewhat, 2=moderately/very much). We fit generalized linear mixed effects models and estimated within-subject and between-subject associations between each stress variable and sleep outcome, respectively, adjusting for time-invariant (age, past-year household income, assigned sex) and time-variant covariates (weekend, cannabis use, alcohol use, pre- vs. post-COVID-19 pandemic).

Results: Participants completed a median of 17 EMA daily records (range: 1-18). Considering between-person effects, participants who reported feeling somewhat stressed with family [B(SE)=-.66(.32), p=0.04] or partner/spouse [B(SE)=-.63(.35), p=0.07] reported lower average TST over the EMA protocol. No associations emerged with experiencing moderately/very much stress in any relationship, nor for SE or midpoint outcomes. Results did not suggest a within-person effect of any type of daily relationship stress on sleep that night.

Conclusion: Among a well-characterized sample with up to 18 days of EMA data, reporting some stress in family and partner/spouse relationships predicted lower TST, relative to peers without stress in these relationships. Results may suggest that cumulative stress over time may be more detrimental for sleep than acute day-to-day stressors. When intervening on sleep, clinicians should also consider relationship stress, which is amenable to evidence-based interventions such as cognitive behavioral therapy.

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0104

BIOLOGICAL EMBEDDING AND SLEEP QUALITY IN ADULTHOOD: EVIDENCE FROM A 30-YEAR PROSPECTIVE LONGITUDINAL COHORT STUDY

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Introduction: Attenuation over the life course of hypothalamic-pituitary-adrenal (HPA) axis activity, such as reduced cortisol secretion, represents biological embedding of early-life stress. Biological embedding is implicated in myriad health concerns including disruptive sleep patterns. We hypothesized that attenuation of cortisol over the first half of the life-course will be negatively correlated with objectively indicated sleep quality in adulthood.

Methods: Cohort participants included females referred by child welfare agencies for having experienced intra-family childhood sexual abuse (CSA) at mean age 10.5 years. A counterfactual group of non-abused females from the same zip codes were demographically matched. The cohort was assessed at 7 timepoints across development longitudinally from 1987-2019. Resting cortisol was obtained through blood (waves 1-3) and saliva (waves 4-6). A formula approved by the US FDA was employed to convert salivary cortisol concentrations to blood-based equivalents: (serum µg/dL) = 5.177 + 15.132*(saliva µg/dL). Using a bilinear spline model – a model for tracking trajectories at different phases of development – pre-knot slopes (rates of change during childhood of cortisol, indicative of HPA attenuation and biological embedding) from waves 1 to 6 (or ages 6-32) were extracted. Wave 7 (mean age 36.1 years) included wrist actigraphy for a week. Ordinary Least Squares (OLS) regression examined whether cortisol slope from ages 6 to 32 predicted adult sleep.

Results: We found no group differences in sleep between participants exposed to CSA and demographically similar non-abused participants. Using individual slopes from T1-T6 models of cortisol levels, we observed a positive correlation between cortisol slope and sleep maintenance efficiency ($r = 0.22$; $p < 0.05$); sleep duration was not significant at Time 7. OLS regression showed that each additional year of increase in cortisol slope (µg/dL) was associated with 21.4% increase ($p < 0.05$) in mean sleep efficiency.

Conclusion: Findings suggest that sleep quality in middle adulthood was better when participants did not experience attenuation of cortisol (biological embedding of stress) earlier in the life course. Our study provides evidence of effects of biomarker-based biological embedding on sleep quality in middle adulthood among a sample of women maltreated as children and a matched control group.

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0105

THE IMPACT OF LIFETIME TRAUMA EXPOSURE AMONG LAW-ENFORCEMENT ON ACTIGRAPHICALLY-RECORDED SLEEP

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Introduction: Law-enforcement officers have a critical mission to ensure public safety and investigate crime, yet frequently report sleep disturbances and mental health challenges. Exposure to trauma common during police duties may contribute to officers' poor sleep, although research is lacking. Moreover, whether trauma exposure influences objective sleep characteristics and which ones may be especially vulnerable is unclear. To this end, this study examined whether cumulative exposure to traumatic events predicted multiple parameters of sleep health derived

from actigraphically-recorded sleep among a sample of police officers during daily duties.
Methods: A sample of mostly day-shift police officers (n=77, 73% male, average age 42) participated in a two-week study where they reported trauma exposure (Life-Event-Checklist for DSM-5), sleep quality (PSQI), including other indicators of health (e.g., Berlin OSA Questionnaire). Subsequently, officers wore the Fatigue Science Readiband for two weeks, which yielded actigraphic estimates of sleep duration, wake-after-sleep-onset, sleep latency, and sleep quality, also producing biomathematical estimates of alertness. Analyses included correlations and regressions controlling for demographic covariates.
Results: In general, 36% of officers reported at least one traumatic event, 25% were at high risk for obstructive sleep apnea, and most officers reported significant sleep complaints. Critically, cumulative exposure to trauma was significantly associated with shorter sleep duration, lower sleep quality, and more frequent awakenings (marginally with PSQI reports). For example, officers who reported trauma slept on average around 20 minutes less per night. These effects were robust amid inclusion of critical covariates (age, sex, height, weight, sleep apnea risk, and generalized anxiety).
Conclusion: The findings provide novel and much needed evidence on the impact of trauma exposure on objectively-recorded sleep among police officers. Trauma exposure was found to impact multiple dimensions of everyday sleep including duration and continuity. Moreover, these effects could not be attributed to demographic differences or currently reported mental distress. The results underscore the presence and impact of trauma on sleep among law-enforcement (even day-shift). They also highlight the need for assessing sleep and fatigue more objectively, as well as sleep and fatigue management intervention efforts.
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0106
COGNITIVE-EMOTIONAL FEATURES OF INSOMNIA PHENOTYPES BASED ON OBJECTIVE SLEEP DURATION IN YOUNG ADULTS

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Introduction: The association of insomnia with adverse mental health outcomes is well-established. Prior research has suggested that cognitive-emotional predisposition to mental health disorders is shared across insomnia phenotypes. However, no study to date has examined this association in insomnia phenotypes based on objective sleep duration in young adults.
Methods: We studied 270 young adults (median 25 years, 53% female, 24% racial/ethnic minority) from the Penn State Child Cohort who underwent a 9-hour polysomnography (PSG) recording, clinical history, and self-report surveys. Insomnia symptoms were defined as difficulties initiating or maintaining sleep, an insomnia diagnosis or complaint, and/or sleep medication use. PSG-measured short sleep duration was defined by the median of the sample (i.e., < 7-h), identifying normal sleep duration (NSD), short sleep duration (SSD), insomnia with normal sleep duration (INSD) and insomnia with short sleep duration (ISSD). Participants completed the Ford Insomnia Response to Stress Test (FIRST), Arousal Predisposition Scale (APS), Personality Inventory for DSM-5 (PID-5-BF), Pre-Sleep Arousal Scale (PSAS), and Depression, Anxiety, and Stress Scale (DASS). A multivariate general linear model tested mean differences in cognitive-emotional outcomes across the four groups, while adjusting for sex, race/ethnicity, age, waist circumference, sleep apnea, cardiometabolic disorders, medication and substance use.
Results: Compared to NSD or SSD, both INSD and ISSD showed significantly higher FIRST (Ps< 0.001), APS (Ps< 0.05), PID-5-BF (Ps< 0.01), PSAS (Ps< 0.001), and DASS (Ps< 0.05) scores, except in the PID-5-BF antagonism and disinhibition trait domains. SSD showed significantly higher FIRST scores compared to NSD (P< 0.05), but no other significant differences were observed on any other scale between SSD and NSD.
Conclusion: Sleep reactivity, cognitive-emotional arousability, internalization, and negative affectivity are trait features of insomnia, which help perpetuate its chronicity and put all phenotypes at risk of adverse mental health outcomes. These data also suggest that sleep reactivity may be a trait present in a subset of short sleepers at risk of developing insomnia.
Support (if any): NIH (R01 HL136587, R01 MH118308, UL1 TR00127)

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0107
BEDTIME PROCRASTINATION MEDIATES THE ASSOCIATION BETWEEN REPETITIVE NEGATIVE THOUGHTS AND INSOMNIA SYMPTOMS

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Introduction: Introduction. Several studies have demonstrated that bedtime procrastination, or the tendency to delay bedtime in the absence of external obligations, is associated with insomnia. However, there is a lack of research on the role of bedtime procrastination in the development of insomnia symptoms. Consistent with the cognitive model of insomnia, bedtime procrastination may serve the purpose of avoiding repetitive negative thoughts associated with bedtime. Accordingly, the present study sought to evaluate the role of bedtime procrastination in the association between proneness to repetitive negative thoughts and insomnia using data from a daily diary evaluation of sleep in young adults.
Methods: Methods. 521 young adult participants (Mage = 24.6, SD = 6.9) completed baseline measures of worry (Penn State Worry Questionnaire) and rumination (Rumination-Reflection Questionnaire) tendencies, in addition to the Insomnia Severity Index. Participants additionally completed 14-days of experience sampling assessment, including self-report measures of nightly pre-sleep arousal and morning sleep diaries and ratings of prior-night bedtime procrastination. Structural equation models were constructed to identify the serial-mediation effect of worry and rumination on insomnia symptoms through pre-sleep arousal and bedtime procrastination.
Results: Results. Bedtime procrastination partially mediated the associations between rumination ($\beta = 0.03$, $p = 0.006$), worry ($\beta = 0.02$, $p = 0.021$), pre-sleep arousal ($\beta = 0.06$, $p < 0.001$), and insomnia symptoms. Furthermore, pre-sleep arousal and bedtime procrastination serially mediated the associations

between worry (β = 0.02, p = 0.001), rumination (β = 0.02, p = 0.001), and insomnia symptoms. Secondary analyses suggest that repetitive negative thought tendencies are associated with poor subjective sleep quality, whereas bedtime procrastination was associated with longer sleep onset latency, wake after sleep onset, and shorter sleep duration.
Conclusion: Conclusion. The current findings suggest that bedtime procrastination may be a relevant behavioral mechanism underlying the association between propensity for repetitive negative thoughts and insomnia symptoms. In these models, ESM-assessed bedtime procrastination, but not proneness to repetitive negative thoughts, was associated with poorer daily self-reported sleep outcomes. Individuals may procrastinate their bedtime to avoid sleep-related repetitive negative thoughts. Further research is needed to elucidate the role of bedtime procrastination in the development of insomnia symptoms.
Support (if any):

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0108
SLEEP DEPRIVATION IMPAIRS THE ABILITY TO REAPPRAISE NEGATIVE SITUATIONS

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Introduction: Sleep and emotion regulation are linked components in the development and maintenance of mental health disorders. Reappraisal is a commonly used emotion regulation strategy that may be impacted by sleep loss. Importantly, the literature to date primarily focuses on sleep-restricted adolescence when discussing the relation between sleep loss and reappraisal.
Methods: This study aimed to examine the relation between sleep deprivation and emotion regulation by asking 76 undergraduate students (39 men, Mage = 19.14; SD = 1.26) to reappraise a series of vignettes translated from the Script-Based Reappraisal Test (SBRT) before and after a randomly assigned night of sleep deprivation or normal sleep. Participants completed Self-Assessment Manikin (SAM) ratings of valence and arousal after each script presentation. At-home sleep deprivation was confirmed with hourly check-ins via Qualtrics and a subset of 10 participants in the sleep deprivation group also wore actigraphy.
Results: Factorial ANOVAS with repeated measures were conducted to examine within-subjects effects, between-subjects effects, and interactions. With regards to valence, sleep-deprived participants struggled to reappraise as indicated by a significant effect of time ($F(1, 74) = 11.23$, $p = 0.001$), condition ($F(1, 74) = 6.55$, $p = 0.012$), and significant interaction ($F(1, 74) = 13.83$, $p < 0.001$). Pairwise contrasts demonstrate that sleep-deprived participants at post-manipulation reported more negative valence compared to their baseline ($t(148) = 4.19$, $p < 0.001$) and the control group at post-manipulation ($t(148) = 4.27$, $p < 0.001$). Additionally, there was a decrease in arousal, as indicated by a significant effect of time ($F(1, 74) = 18.93$, $p < 0.001$), condition ($F(1, 74) = 5.08$, $p = 0.027$), and significant interaction ($F(1, 74) = 8.31$, $p = 0.005$). Pairwise contrasts demonstrate that sleep-deprived participants at post-manipulation reported less arousal compared to their baseline ($t(148) = 3.80$, $p = 0.001$) and the control group at post-manipulation ($t(148) = 3.43$, $p = 0.004$).
Conclusion: This study expands the current literature on sleep loss and reappraisal. Findings may help inform mental health providers when working with patients that may struggle with emotion regulation concepts such as reappraisal.
Support (if any): Internally funded Howells Student Research Grant (Grant Number: 2110.01S)

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0109
A GENDER DISPARITY IN THE EXPERIENCE OF FEAR IN DREAMS

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Introduction: Determining whether gender differences exist in dream experiences is crucial for understanding potential disparities in offline emotional processing. Women tend to experience more nightmares (i.e., dreams characterized by fear) than men, which could indicate a failure of overnight fear extinction. Yet, there is mixed evidence as to whether gender differences in dream emotions exist. To resolve this ambiguity, our study employed a novel natural language processing (NLP) tool on a large dataset to explore potential gender disparities in the experience of fear in dreams.
Methods: Data utilized in this study were sourced from Cunningham et al.'s (2020) sleep and mental health daily survey conducted at Boston College, involving 667 participants (Female = 569, Male = 98). Dream reports and sleep efficiency calculations were surveyed across several days and self-reported gender, age, and neuroticism scores were surveyed once. We applied a deep learning NLP model to dream reports to estimate a regression value representing fear intensity from the text. Mean values per participant were computed for dream fear, dream report word count, and sleep efficiency. We fitted a general linear regression model to test whether mean dream fear could be predicted using binary self-reported gender while controlling for mean dream report word count, mean sleep efficiency, neuroticism, and age.
Results: Female identity was significantly associated with higher mean dream fear independent of mean sleep efficiency, mean dream report word count, trait neuroticism, and age, β = -0.03, SE = 0.01, 95% CI: [-0.05, -0.01], $p < .001$. All variables except for age were significantly related to mean dream fear.
Conclusion: We found that those who experienced greater fear in dreams were more likely to be female identifying, after controlling for other variables. Mean sleep efficiency, mean dream report word count, and neuroticism were significantly related to higher mean dream fear. Word count may be related to dream fear due to a bias in the NLP model. Future research should investigate differences in dream fear among other gender identities, collect a more representative sample, and include measures of stress and trauma as possible explanatory variables of gender disparities in dream fear.
Support (if any):

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0110
INSOMNIA SYMPTOM PREVALENCE BY FOSTER CARE HISTORY FROM ADOLESCENCE TO ADULTHOOD

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Introduction: Known associations between stress and sleep suggest that early-life adversity faced by children who spend time in foster care (FC) confers vulnerability to sleep disturbances,

though research in this population is scarce. We utilized data from a nationally representative longitudinal study to examine insomnia symptom prevalence by FC history from adolescence to adulthood.
Methods: Participants were from the National Longitudinal Study of Adolescent to Adult Health (N=6,954, representing 21,059,854), 1.5% had a history of FC involvement (N=123, representing 318,515), 50% were female, 65% were non-Hispanic (NH) white, 15% were NH Black, and 10% reported a resident parent receiving public assistance at Wave I (W1). Participants were in grades 7-12 during W1, grades 8-12 in Wave II (W2), ages 24-32 in Wave IV (W4), and ages 33-43 in Wave V (W5). Participants were considered positive for insomnia symptoms if they reported trouble falling asleep or staying asleep ≥ "3 times per week", "often or every day", or "almost every day or every day". Design-based analyses were conducted, including use of sampling weights. Poisson regression was used to estimate whether relative risk for insomnia differed at each wave by FC history, and prevalence estimates were estimated at each wave, adjusting for demographic characteristics.
Results: The relative risk for insomnia symptoms was significantly greater among those with a FC history at W1 (p=.039), W2 (p=.001), and W4 (p=.000), but not W5 (p=.840). Insomnia symptom prevalences among those with versus without FC history were: 20% versus 11% (W1), 20% versus 8% (W2), 51% versus 27% (W4), and 31% versus 30% (W5).
Conclusion: Among individuals in the US, those with a FC history experience substantially higher risk for significant insomnia symptoms from adolescence to ages 24-32, but this difference disappears around ages 33-43. Addressing sleep issues in the FC population is of critical public health importance. Future research should examine how sleep disturbances contribute to poor health outcomes in the FC population.
Support (if any): This research uses data from Add Health, funded by grant NICHD:P01 HD31921, NIA:U01 AG071448 and U01AG071450. DMR was supported by NIMH:5T32MH014592-39; the Sleep Research Society Foundation, NICHD:T32HD101392. DMR & SP received support from NIGMS:P20GM139767.

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0111
NIGHTTIME VAGAL NERVE STIMULATION INTERACTS WITH SLEEP TO PREDICT NEXT-DAY AFFECTIVE STATES

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Introduction: Sleep and the autonomic nervous system (ANS) independently modulate emotional experiences and interact bidirectionally - changes in ANS modulate sleep and stages of sleep are associated with distinct autonomic profiles. Changes to ANS via transcutaneous vagal nerve stimulation (tVNS) can improve emotion recognition and mood, however, the role of sleep has not been considered. We used a 14-day within-subject, sham-controlled study to examine the impact of nightly tVNS administration on sleep and morning affect.
Methods: Participants(N=20participants, aged=18+) received seven continuous days of non-invasive, active or sham (counterbalanced) tVNS via the left cymba concha between 9PM-11PM each night across two weeks in naturalistic sleeping conditions. Participants completed morning and nightly affect diaries and wore an actigraph watch to track sleep/wake behavior (N=136observations). Affect was aggregated into high-arousal/negative (distressed, irritable), low-arousal/negative (nervous, on edge), high-arousal/positive (alert, attentive, happy), and low-arousal/positive (content, safe). Actigraphy determined total sleep duration, wake minutes in bed, sleep onset latency(SOL), and sleep continuity or wake after sleep onset(WASO).
Results: Linear mixed effects models examined how night affect, stimulation condition, and sleep behavior predicted next morning affect. A three-way-interaction emerged: low-arousal/negative affect pre-sleep predicted low-arousal/negative affect post-sleep on nights when people experienced longer SOLs and active stimulation (ß=-.40, p=.002). Importantly, on nights with shorter SOL, active stimulation led to reductions in low-arousal/negative affect the next morning (ß=-.63, p=.02). Another three-way-interaction emerged such that low-arousal/negative affect, active stimulation, and WASO at night predicted low-arousal/negative affect in the morning. Nights with less WASO and sham stimulation predicted mornings with low-arousal/negative affect (ß=1.26, p=.03). Also, a three-way interaction suggested that nights with high-arousal/negative affect, more WASO, and sham stimulation, also led to mornings with high-arousal/negative affect. However, nights with high WASO and active stimulation led to mornings with the highest amount of high-arousal/negative affect (ß=.89, p=.003). Lastly, low-arousal/positive affect at night led to morning increases in the same emotions, but active stimulation blunted this effect (ß=-.58, p=.04).
Conclusion: Findings suggest that sleep and tVNS are influential in mitigating or intensifying the impact of nighttime affective states on morning affect, particularly for negative emotions. TVNS's impact on noradrenergic signaling may account for these findings.
Support (if any):

Abstract citation ID: zsae067.0112

0112
ETHNORACIAL DIFFERENCES IN THE ASSOCIATION BETWEEN WITNESSING VIOLENCE AND SLEEP DURATION AMONG YOUNG ADULTS

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Introduction: Experiences of interpersonal violence negatively influence sleep and health. Prior research has also shown that being aware of interpersonal violence experienced by friends and family is associated with short sleep duration. We seek to understand whether sleep is disrupted by witnessing or experiencing physical violence.
Methods: Data were from the age 22 wave of the Future of Families and Child Wellbeing Study (N=444). Young adults wore a wrist actigraphy device for 14 days and self-reported their experiences with physical violence over the prior year. Witnessing and experiencing violence were classified in four ways: witnessing/experiencing violence by someone not close and witnessing/ experiencing violence by someone close. Separate linear regression models assessed the cross-sectional associations of experiences of violence with nighttime total sleep time (TST), adjusting for race/ethnicity, gender, and educational level. Secondary analyses

assessed race/ethnicity as a moderator of violence on night sleep duration.
Results: 33% of young adults witnessed violence perpetrated by someone not close to them, 13% experienced violence by someone not close to them, 16% witnessed violence by someone close to them, and 8% experienced violence by someone close to them. There were no significant main effects of any type of violence on TST. There were interaction effects of witnessing violence (not close AND close) and race on mean TST. Post-hoc tests on witnessing violence by someone not close revealed White young adults had lower TST (42 minutes, p< 0.009) compared to White young adults who had not witnessed violence by someone not close to them. In addition, post hoc tests on witnessing violence by someone close revealed Black young adults had higher TST (20 minutes, p< 0.046) compared to Black young adults who had not witnessed violence by someone close to them, whereas White young adults had lower TST (43 minutes, p=< 0.037) compared to White young adults who had not witnessed violence by someone close to them.
Conclusion: We observed ethnoracial differences in associations between witnessing physical violence and sleep. More research is needed to further explain these interactions.
Support (if any): R25-HL147668, R01HD073352, R01HD36916, R01HD39135, R01HD40421.

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0113

SLEEP MODERATES DEPRESSION AND QUALITY OF LIFE IN PEOPLE WITH CHRONIC ILLNESSES IN SOUTH AFRICA & THE UNITED STATES

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Introduction: In the era of global health challenges, escalating chronic physical and mental health issues, coupled with sleep problems, threaten individual well-being and burden healthcare systems. This study evaluated the moderating role of sleep on the depression-quality of life (QOL) association in individuals aged 50+ with chronic illnesses in South Africa (SA) and the United States (US).
Methods: We studied 16,556 participants with at least one chronic illness (i.e., hypertension, diabetes, or cardiovascular disease). Data were drawn from the Health and Retirement International Family of Studies (N=3,379 in SA; N=13,177 in the US). To generate a sleep disturbance score, we averaged responses to three items: 'my sleep is restless' (no=0/yes=1), 'waking up too early' (rarely or never=0/sometimes=1/most of the times=2), and 'feeling rested' (most of the times=0/sometimes=1/rarely or never=2). To generate a QOL score, we summed responses to two questions about 'life satisfaction as a whole' (coded 2-10) and 'position on the life satisfaction ladder' (coded 0-10). Depressive symptoms were assessed via the 8-item Center for Epidemiological Studies-Depression scale. Pre-statistical harmonization aligned common items across the datasets, and country-specific regression analyses were conducted due to measurement non-invariance.
Results: After adjusting for demographic and health-related confounders, greater sleep disturbance was associated with lower QOL in SA (B=-0.52, 95% confidence interval (CI) =-0.55, -0.48) and the US (B=-0.48, 95% CI =-0.49, -0.47). Higher depression symptoms were associated with lower QOL in both SA (B=-0.26, 95% CI =-0.28, -0.25) and the US (B=-0.42, 95% CI =-0.42, -0.41). Sleep disturbance moderated the depression–QOL association in both countries, such that the negative association between depression symptoms and QOL was stronger among those with greater sleep disturbances, but moderation was much stronger in SA (B=-0.35, 95% CI =-0.38, -0.33) than in the US (B=-0.02, 95% CI =-0.02, -0.01).
Conclusion: The interaction of depression symptoms and sleep disturbances on lower QOL emphasizes the need to integrate routine depression/sleep disturbance screening and treatment in populations with chronic illnesses. Policy recommendations include culturally tailored sleep and depression interventions while future research recommendations include exploring the temporal interrelationships among depression symptoms, sleep disturbance, and quality of life.
Support (if any):

Abstract citation ID: zsae067.0114

0114

"MY MOTHER DOESN'T SLEEP WHEN IT RAINS AT NIGHT": ASSESSING THE IMPACTS OF A CLIMATE-RELATED FLOOD ON SLEEP

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Introduction: Climate change and climate-sensitive disasters pose a serious threat to sleep health. Populations with pre-existing sleep and health disparities are particularly vulnerable to disaster related stress. In 2022 Eastern Kentucky, home to some of the nation's largest "hotspots" of insufficient sleep, experienced thunderstorms resulting in 14-16 inches of rain. Subsequent catastrophic flooding and landslides claimed more than 40 lives and left thousands homeless. The present study used mixed methods to investigate the impacts of this flood disaster on the sleep and health of flood survivors.
Methods: We collected two waves of qualitative and quantitative data from 25 participants (18+) living in five flood-impacted counties in Eastern KY. Data were collected at 9- and 15-months post-flood. Semi-structured qualitative interviews at both waves explored perceived flood impacts on sleep and health. Quantitative surveys assessed sleep, stress, trauma symptoms, and other health outcomes via well-validated scales. Interviews were professionally transcribed and coded using an inductive process and NVIVO software. Insomnia symptoms were assessed using the Insomnia Severity Index (ISI).
Results: At 9 months post-flood 77% of participants' ISI scores were □15 suggesting clinically significant insomnia. Fifteen months post-flood, 68% of participants reported ISI scores □15. Most (72%) participants reported that the flood event and its aftermath directly impacted their sleep. Sixty-one percent reported delays in falling asleep and increased nighttime awakening; 22% woke up too early. Over half (56%) had racing or recurring thoughts related to the flood and 44% had nightmares. In interviews participants specifically linked increased anxiety to their difficulties with sleep. Many said that the sound of rain triggered an inability to fall or stay asleep in themselves or a family member. Changes in sleep environment also disrupted sleep; issues included destroyed or damaged housing, temporary housing, and mold problems.
Conclusion: Flood survivors in Eastern KY, a region already rife with sleep and health disparities, reported disturbed sleep at 9- and 15-months post flood. The sound of rain and/or changes

in sleep environment impacted survivors' sleep long after the flood event. As climate-sensitive disasters increase, sleep health in vulnerable populations must remain a focus of research and intervention.

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0115

HOW PRE-SLEEP NEGATIVE AFFECT AND RUMINATION IMPACT SLEEP ONSET

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Introduction: Getting a good night's sleep is critical to several aspects of daily functioning and health, but many choices may hinder an individual's onset of sleep. The impact of negative emotion on subsequent sleep has received limited attention and causal claims require strong experimental methodology. One contributor to delayed sleep onset may be rumination, as ruminating individuals' may negative emotions may persevere longer. The current study aimed to examine the impact of emotions on sleep immediately after experiencing an emotionally disturbing video and the role of individual differences, specifically rumination tendencies.

Methods: Using a within-subjects, at-home design, participants (N=149) encountered two nights of control videos and two nights of emotionally distressing videos immediately before their normal sleep time. Rumination tendencies were measured at baseline using the Rumination-Reflection Questionnaire by Trapnell and Campbell. Mood and negative affect were recorded before and after watching the videos and their subsequent sleep was recorded using actigraphy. Participants self-reported sleep-onset latency (SOL) in minutes.

Results: The manipulation was effective at inducing negative emotions including anger ($d = 0.596$, $p < 0.001$), disgust ($d = 1.513$, $p < 0.001$), and fear ($d = 1.058$, $p < 0.001$). A paired samples t-test showed no meaningful differences on self-reported SOL between control and experimental nights ($p = .596$). While control nights did have a slightly higher average SOL than experimental, the averages differed by 1.1 minutes. Preliminary analysis revealed no significant correlations of rumination on experimental or control SOL, with rumination correlated to overall SOL 0.05.

Conclusion: Despite effective induction of pre-sleep negative affect, preliminary analyses showed there were no substantive differences between control and experimental conditions in participants' self-reported SOL (despite adequate statistical power), although the reports may be inaccurate due to self-report biases. Future analyses of actigraphic data will evaluate more objective aspects of sleep and roles of other individual differences.

Support (if any): N/A

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0116

MULTIDIMENSIONAL PERFECTIONISM AND SLEEP: THE ROLE OF SELF-COMPASSION

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Introduction: Prior studies have indicated that perfectionistic behavior among college students is linked to sleep difficulties. However, there is currently limited research on conditions and protective factors that might help elucidate this association. The current study examined whether self-compassion moderated the association between the two higher-order dimensions of perfectionism and sleep difficulties in a sample of college students.

Methods: A total of 178 college students ($M = 19.88$, $SD = 1.50$) completed self-report measures assessing perfectionism, self-compassion (Self-Compassion Scale), and sleep (Pittsburgh Sleep Quality Index). This study took a multi-measure approach to capture the two higher-order dimensions of perfectionism – perfectionistic strivings (PS) and perfectionistic concerns (PC). Specifically, subscales from the three most common measures of multidimensional perfectionism (Frost Multidimensional Perfectionism Scale, the Hewitt-Flett Multidimensional Perfectionism Scale, and the Revised Almost Perfect Scale) were combined to form composite scores of PS and PC. Sleep was also measured objectively via wrist-actigraphy (ActiGraph GT3X+), which participants wore for three continuous weekday nights. Sleep diary data were collected to score and validate the actigraphy data.

Results: Moderation analyses were performed to examine the interaction of perfectionism and self-compassion on sleep outcomes. Findings indicated a significant and moderate interaction between PS and self-compassion when predicting poor sleep quality. Simple slope analyses indicated that the negative association between PS and poor sleep quality was significant at high levels of self-compassion ($\beta = -.29$, $SE = .10$, 95 % CI [-.49, -.09], $t = -2.82$, $p = .005$) followed by average levels of self-compassion ($\beta = -.17$, $SE = .07$, 95 % CI [-.31, -.02], $t = -2.24$, $p = .026$). Findings also indicated that college students with higher PC or lower self-compassion tendencies self-reported sleep difficulties despite having observable actigraphic sleep disturbances.

Conclusion: This study expands the current perfectionism and sleep literature by examining whether the moderating role of self-compassion can explain previous heterogeneous findings. Furthermore, the discrepancies between sleep methods observed in the current study highlight the importance of incorporating objective sleep measures as an adjunct to subjective and self-report measures of sleep to provide a more comprehensive assessment of sleep in relation to perfectionism and self-compassion.

Support (if any):

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0117

EMOTIONAL SUPPORT IS THE STRONGEST PREDICTOR OF SLEEP DISTURBANCES AMONG A SAMPLE OF PERINATAL WOMEN OF COLOR

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Introduction: Racial and ethnic minorities face a higher prevalence of maternal mental health conditions (e.g. postpartum depression and anxiety), compared to their White counterparts. Yet, studies have shown White women are more likely to get a diagnosis and treatment for postpartum depression compared to Black or Latina women. Lack of emotional and social support are known to be linked with poor health outcomes that are also associated with sleep. Yet, little is known about the direct

relationship between emotional support and sleep health, especially among perinatal women of color.
Methods: This work utilized data from Nurturing Moms, a pilot study investigating the effect of a virtual reality program on maternal stress among expectant (0-36 weeks gestation) and postpartum (up to 12 months after birth) women of color. Participants (n=46) completed baseline surveys that captured psychological, emotional, behavioral, and sleep data. These surveys included Patient-Reported Outcomes Measurement Information System (PROMIS) measures of Emotional Support and Sleep Disturbance, among others. For the current study, we hypothesized that emotional support will be associated with sleep disturbance outcomes. Multilinear regression was performed using SPSS to determine if emotional support predicted sleep disturbance.
Results: Twenty-three expectant (29.3±4.8 years) and twenty-three post-partum (31.6±5.1 years) women completed online baseline surveys. Emotional support was found to be significantly associated with sleep disturbance in the expectant moms cohort [$F(4,18) = 4.68$, $p=0.009$] and in the post-partum mothers cohort [$F(4,18) = 5.73$, $p=0.004$]. The regression analysis indicates that lower emotional support predicted greater sleep disturbance ($\beta1= -0.525$) among expectant mothers and ($\beta1= -0.388$) among post-partum mothers, albeit a greater magnitude was observed among expectant mothers.
Conclusion: Emotional support was found to be strongly associated with sleep disturbance in a cohort of pregnant and post-partum women of color. With recent efforts geared toward addressing the maternal health crisis, this study highlights the importance of focusing on racial-ethnic minorities when investigating the impact of support on sleep health. Further studies exploring the relationship between emotional support and sleep among perinatal women of color are needed to implement interventions that will target maternal mental health in the United States.
Support (if any): K01HL135452, R01HL152453, R01HL142066, R01HL095799, R01AG072644, RO1MD004113, R01AG067523, R01AG075007

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0118

SLEEP QUALITY AMONG SEXUALLY ABUSED AND NON-ABUSED FEMALES IN THE FEMALE GROWTH AND DEVELOPMENT STUDY

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Introduction: Lower sleep quality in adulthood can be a manifestation of trauma experienced during earlier stages of development. Sleep problems are also common among adults with chronic health conditions, such as diabetes and heart disease. However, there is scarcity of evidence on potential moderating effect of chronic health conditions in the association between post-traumatic stress disorder (PTSD) and poor sleep in adulthood. We examined the relationship between PTSD symptoms (PTSS), biomarkers of diabetes type 2, and sleep health.
Methods: Participants are comprised of sexually abused (as children) and non-abused females from the Female Growth and Development Study (FGDS), a longitudinal study following participants across seven waves from childhood to adulthood (1987-2019). From Comprehensive Trauma Interviews at waves 4-6, we identified trajectories of PTSD using growth mixture modeling. At wave 7, actigraphy was conducted and blood samples were used to measure Hemoglobin A1C. We focused on participants with ≥ 3 valid days of actigraphy data (n = 100). Analysis of covariance (ANCOVA) examined the relationship between PTSS, Hemoglobin A1C (normal, prediabetes, diabetes) and sleep [duration, efficiency, and wake time after sleep onset (WASO)], controlling for sexual abuse status, age and race.
Results: Over half of the participants (51%) ever had PTSS and 16% had HbA1C at prediabetes or diabetes stages. Although ANCOVA results did not detect significant interaction effects of PTSS and diabetes on sleep, we found heterogeneity in the distributions of the sleep measures. For instance, sleep efficiency was lower among participants who had co-occurrence of PTSS and prediabetes /diabetes (M = 88.0 %, SD = 5.1) relative to those who had prediabetes /diabetes but no PTSS (M = 91.1 %, SD = 2.0). Compared with participants with prediabetes /diabetes but no PTSS (M = 39.9 min/night, SD = 12.8), those with PTSS and prediabetes had greater mean WASO (M = 50.0 min/night, SD = 21.6).
Conclusion: Participants who had both PTSS and prediabetes/diabetes experienced elevated sleep problems. Future research should investigate how chronic health conditions may affect sleep among individuals with PTSS related to childhood maltreatment.
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0119

SYMPTOMS OF POST-TRAUMATIC STRESS DISORDER AND SELF-RATED MULTIDIMENSIONAL SLEEP HEALTH

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Introduction: Sleep disturbances are common among individuals with posttraumatic stress disorder (PTSD). Individuals with PTSD experience heightened sensitivity in brain regions involved in fear and emotion regulation, which may impair sleep onset, maintenance, depth, duration and quality. This suggests that PTSD may be influencing multiple aspects of sleep at once. Thus, the goal of this study was to examine associations between symptoms of PTSD, and self-rated multidimensional sleep health.
Methods: A community sample of midlife adults living in the deep south (N=70; Age=52.93±9.05; Female=75.7%; 11.42% African American) completed a demographic measure, the PTSD Checklist for DSM-5 (PCL-5), and a self-rated measure of multidimensional sleep health (created by summing scores on items assessing satisfaction, duration, regularity, alertness, efficiency and timing). Bivariate correlations were conducted to test the association between symptoms of PTSD and sleep health. Follow-up multiple regression analyses were used to examine the association between sleep health and symptoms of PTSD, while adjusting for sex, age, and BMI. Exploratory analyses were conducted to determine which aspects of sleep health were driving any significant associations with PTSD symptoms.
Results: Bivariate correlations revealed significant negative relationships between symptoms of PTSD and self-rated multidimensional sleep health ($r=-0.349$, $p=0.003$). After accounting

for age, sex, and BMI, regression analyses demonstrated a significant inverse relationship between symptoms of PTSD and sleep health, such that a one unit increase in PTSD symptoms corresponded to a 0.09 decrease in a multidimensional measure of sleep health (b=-0.099, t=-3.24, p=.002, R2=0.144). In separate multiple regression models, accounting for BMI, age and sex, greater PTSD symptoms were associated with poor sleep satisfaction (b=-0.021, t=-2.49, p=.015, R2=0.137) and poor sleep efficiency (b=-0.029, t=-2.90, p=.005, R2=0.131), but unrelated to other aspects of sleep health (ps > .05).
Conclusion: Symptoms of PTSD were significantly negatively associated with self-reported multidimensional sleep health. These results were driven primarily by poor sleep efficiency and satisfaction with sleep. These findings add to growing literature on PTSD and sleep and suggest specific targets for interventions.
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0120
SLEEP PATTERNS AMONG HAITIANS: "TO SLEEP AT NIGHT THEN WAKE UP AT 11 PM TO RUN"

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Introduction: This study examines the effects of political and gang violence on the mental and sleep health of Haitians in the United States and Haiti.
Methods: In the Haitian Well-Being Study, we conducted four Zoom focus groups, involving 28 participants (20 Haitian women and 8 men) aged 23 to 60, located in both the United States and Haiti. These sessions, lasting approximately 60 minutes each, aimed to assess the mental health repercussions of traumatic events in Haiti. Qualitative analysis of the focus group transcripts was employed using thematic analysis.
Results: Our study identified six key themes: 1) Poor Mental Health: Participants reported persistent anxiety, chronic acute stress, and symptoms akin to post-traumatic stress disorder (PTSD), attributed to the deteriorating situation in Haiti and interpersonal traumas such as kidnappings and sexual assault. 2) Poor Sleep Health: Concerns about daily and nocturnal gang violence, traumatic experiences, and mobility restrictions disrupted sleep patterns and quality. 3) Lack of Access to Resources: Limited access to healthcare, especially mental health services, was a recurring concern, emphasizing the need for culturally appropriate support within Haitian communities. 4) Mental Health Stigma: Seeking help from psychologists was stigmatized, discouraging individuals from seeking mental health support. 5) Cumulative Trauma Exposure: Participants shared past traumatic experiences, including PTSD symptoms such as re-experiencing and nightmares triggered by specific images, which continued to impact their mental health. 6) Recommendations for Mental Health Programs: Participants emphasized the urgency of restoring security in Haiti, enabling those displaced by gang violence to return to safe housing and reunite with loved ones. They also suggested community-based interventions, raising awareness about mental health, and significant investments in mental health training to address the widespread impact of violence in Haiti.
Conclusion: This study highlights the profound and complex effects of political and gang violence on the mental and sleep health of Haitians. To address these challenges effectively, participants stressed the importance of restoring security in Haiti, expanding access to mental health resources, reducing stigma, and implementing community-based interventions to support those affected by violence. Additionally, this qualitative study underscores the role of sleep health in disaster relief and global health efforts.
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0121
DISCRIMINATION ATTRIBUTED TO PERSONAL CHARACTERISTICS AND SLEEP HEALTH AMONG BLACK/AFRICAN AMERICAN YOUNG ADULTS

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Introduction: Perceived discrimination is associated with sleep health problems. This association is even stronger among Black/African Americans, who are typically exposed to more frequent discrimination in the US. Limited research examines how perceptions of discrimination impact young adults' sleep health, particularly using objective measures. The current study investigated the association between perceived discrimination experiences and sleep health among Black/African American young adults.
Methods: Data from age 22 wave of the Future of Families and Child Wellbeing, Young Adult Sleep Study (YASS) included Black/African American young adults (n = 221) who self-reported experiences of discrimination due to their race/skin color, gender, and age. Wrist-worn actigraphy measures across ~2 weeks included sleep duration, sleep maintenance efficiency, and wake after sleep onset (WASO). Multiple linear regression models examined the association between perceived discrimination experiences based on personal attributes and dimensions of sleep adjusting for age, gender, and educational attainment.
Results: Among this sample of Black/African American young adults, perceived experiences of discrimination in their life were not associated with actigraphic sleep duration. Perceived discrimination attributed to race/skin color, age, or gender were not associated with sleep duration. Perceived experiences of discrimination in their life were also not associated with actigraphic sleep maintenance efficiency. Perceived discrimination attributed to age was associated with lower sleep maintenance efficiency (-3.01%, p<.001) and more WASO (+10.64 minutes/night, p=.004) compared to young adults who did not perceive age discrimination. Perceived discrimination attributed to gender was associated with lower sleep maintenance efficiency (-2.12%, p=.023) and more WASO (+9.47 minutes/night, p=.019), and were not different between women and men. Gender did not modify associations of sleep measures with perceived discrimination attributed to race/skin color or age.
Conclusion: Black/African American young adults' perceived discrimination due to specific personal attributes (age and gender) are linked to lower sleep maintenance efficiency and more

WASO. Future longitudinal research should examine whether perceived discrimination in young adulthood predicts poorer sleep health across time.

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0122

DEVELOPMENT AND INITIAL VALIDATION OF THE DANIELI-ARIZONA BORDER INTERGENERATIONAL TRANSMISSION OF STRESS SCALE

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Introduction: Intergenerational transmission of stress is an underrecognized potential contributor to sleep and mental health disparities among at-risk populations. No existing tool captures this construct as experienced at the US-Mexico Border.
Methods: The DABITSS was originally developed based on the Danieli Inventory of Multigenerational Legacies of Trauma developed for families of Holocaust survivors and was adapted to the border region through a series of focus groups. The end result is a scale in both English and Spanish that consists of 3 subscales: Parents (46 items, parental behaviors indicating transmission of stress), Adaptations (25 items, thoughts, feelings, and behaviors that represent internalization of stress), and Experiences (35 items, events that may induce intergenerational stress). Total scores for the Parents and Adaptations subscales range from 0-100, for a total score of 0-200. The Experiences scale ranges from 0-35. Scale and total scores were evaluated relative to insomnia (Insomnia Severity Index), depression (PHQ9 scale), and adverse childhood experiences (ACEs questionnaire). Models were adjusted for age, sex, ethnicity (Mexican or White), survey language (English or Spanish), immigrant status, and acculturation.
Results: DABITS scores on the Parents subscale ranged from 0.54-63.98 (M=28.99, SD=15.31); scores on the Adaptations subscale ranged from 5-65 (M=33.90, SD=14.51); scores on the Experiences subscale ranged from 0-20 (M=5.11, SD=3.57), and total scores [(Parents+Adaptations)/2] ranged from 10.54-123.06 (M=62.89, SD=26.27). Insomnia severity was associated with Parents (B=0.85, 95%CI [0.10, 1.60]), Adaptations (B=1.16, 95%CI [0.50,1.81]), and total score (B=2.01, 95%CI [0.76,3.25]). Depression was associated with Parents (B=1.09, 95%CI [0.25,1.93]), Adaptations (B=1.29, 95%CI [0.55,2.02]), Experiences (B=0.25, 95%CI [0.06,0.45]), and total score (B=2.38, 95%CI [0.99,3.77]). ACEs score was associated with Parents (B=2.91, 95%CI [1.15,4.67]), Adaptations (B=1.87, 95%CI [0.24,3.51]), Experiences (B=0.99, 95%CI [0.61,1.36]), and total score (B=4.79, 95%CI [1.78, 7.79]). Additional analyses are planned for other sleep (duration, quality, disorders, sleepiness) and mental health (anxiety, stress) measures.
Conclusion: The DABITSS scale represents multiple dimensions of intergenerational stress (how it was passed on, how it is experienced, and what may have triggered it). These dimensions are related to sleep and mental health.
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0123

FAMILY ECONOMIC STRAIN IS ASSOCIATED WITH PARENT-CHILD SLEEP INTERACTIONS

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Introduction: Family economic strain is perceived financial hardship that can be experienced regardless of income level but is more prevalent among families of low socioeconomic status (SES). Low SES is an important social determinant of health and is associated with poor sleep in children, but pathways between financial hardship and child sleep are unclear. In this study, we examine the role of family processes in this relationship, including caregiver stress and parent-child sleep interactions (sleep location, praise, tantrums).
Methods: We conducted a cross sectional study of caregivers in the United States with children aged 3-5 years. Caregivers completed the Family Economic Strain Scale (FESS), Parent-Child Sleep Interactions Scale (PSIS), Perceived Stress Scale (PSS), and a demographics form via Qualtrics. Participants were recruited through social media and community flyers. Adjusting for child age, household size, and caregiver relationship status, we conducted multivariate linear regression to examine associations between economic strain, perceived stress, and parent-child sleep interactions. We then tested mediation using 5,000 bootstrap samples.
Results: 111 caregivers completed all questionnaires. Higher family economic strain (β=.472, p<.001) and perceived stress (β=.357, p<.001) were associated with more problematic parent-child sleep interactions. Family economic strain was also associated with increased perceived stress (β=.559, p<.001). However, perceived stress did not mediate the relationship between family economic strain and problematic parent-child sleep interactions (95% CI -0.46, 2.4).
Conclusion: Increased family economic strain is associated with increased stress in caregivers, and both economic strain and caregiver stress are associated with problematic parent-child sleep interactions. Therefore, supporting caregivers in promoting healthy bedtime interactions may be an important approach for intervention to promote sleep and reduce inequities related to financial strain and stress. Further, our findings suggest the relationship between family economic strain and parent-child sleep interactions is not attributable to increased caregiver stress. Additional research is needed to understand the relationship between family economic strain and child sleep, including the role of other social determinants such as caregiver shift work, employment, housing, and the neighborhood environment. Findings from this study and future research may inform multilevel and policy interventions to support children at risk for unhealthy sleep.
Support (if any):

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0124

THE EFFECTS OF FAMILY ARGUMENTS ON PARENTAL SLEEP QUALITY

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Introduction: Previous studies indicate that stress and trauma within family systems can affect the sleep quality of all family members. While most research on parent-child conflict and sleep has focused on child outcomes, this study aims to investigate the potential role of familial stress caused by arguments between families on the quality of parent's sleep through the lens of Bowen's Family Systems Theory.
Methods: Cross-sectional data from the Early Childhood Longitudinal Study-Kindergarten (ECLS-K) 2011 cohort's 5th grade parent surveys in 2016 were utilized to understand the feelings of parents and other guardians on how often they argue with their children, how often they felt restless during their sleep, and how often they feel depressed. To assess the effects of parent-child conflict on parent report of restless sleep, two survey-weighted logistic regression models were created, both adjusting for parent and child age and one also adjusting for parental depression, and average marginal effects were calculated.
Results: The analysis included 8,375 parents and guardians, with a mean age of 39.9 years (SE = 0.17), of whom 14.0% reported mostly or always arguing with their child, 15.0% usually experiencing restless sleep, and 3.9% that they feel depressed most or all of the time. The first regression model found that parents report of frequent parent-child conflict was associated with an 13.2% increase (95%CI 10.4 to 16.1) in the predicted probability of parent restless sleep, an effect which decreased in size but remained significant after adjusting for parental depression (to a 9.1% increase, 95%CI 6.5 to 11.6), which may be a partial mediator of this effect.
Conclusion: These results emphasize the significant impact of familial arguments on parental restlessness, emphasizing the critical role of family cohesion in shaping parent's sleep quality. One important limitation is the temporality and causality of the relationship between familial arguments, depression, and restless sleep, which cannot be evaluated with these models and requires further research.
Support (if any):

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0125

THE ASSOCIATION BETWEEN MATERNAL CLOSENESS AND SLEEP HEALTH DURING ADOLESCENCE

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Introduction: Quality of the parent-child relationship is an important factor for children's psychological health and adequate sleep. Few studies, however, have focused specifically on maternal closeness and adolescent sleep. We hypothesized that there would be an association between maternal closeness and improved dimensions of sleep health including timing, duration, and quality in adolescents.
Methods: Data were from the age 15 wave of the Future of Families and Child Wellbeing Study, a longitudinal birth cohort. Adolescents self-reported maternal closeness on a continuous scale with four levels ("not very close," "fairly close," "quite close," and "extremely close") and bedtime, sleep duration, and nights with difficulty falling or staying asleep (N=3,241). A subset of adolescents wore an actigraph to assess sleep onset, duration, wake after sleep onset, and sleep maintenance efficiency (N=775). Separate multiple linear regression models tested maternal closeness and sleep outcomes, adjusting for age, sex, race/ethnicity, household income, family structure, and caregiver education level.
Results: Results showed that 84.4% of adolescents reported feeling "quite close" or "extremely close" to their mother. For each unit closer to their mother, adolescents' self-reported sleep duration was 12.2 minutes longer ($p < 0.001$), bedtime was 11.3 minutes earlier ($p < 0.001$), and they reported 1.7 fewer nights with difficulty falling asleep ($p < 0.001$) and 1.3 fewer nights with difficulty staying asleep ($p < 0.001$). With the smaller actigraphy sample, maternal closeness was not associated with actigraphic sleep outcomes.
Conclusion: Cross-sectional findings suggest that maternal closeness is associated with improved self-reported sleep health as measured by longer sleep duration, earlier bedtime, and fewer nights of insomnia symptoms. However, it is not clear whether closeness directly affects sleep or whether sleeping well improves the parent-child relationship. Future research should leverage micro-longitudinal studies to assess the daily fluctuations in maternal closeness and sleep.
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0126

ADVERSE LIFE EVENTS AND EMOTION DYSREGULATION IN ADOLESCENTS: SLEEP DISTURBANCES AS A POTENTIAL MODERATOR

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Introduction: Adverse life events (ALEs) are linked with emotion dysregulation, negative affect, and risk for psychopathology. Sleep is adaptive for processing stressors and emotion, and inadequate sleep can increase negative emotions and alter individuals' understanding, management, and expression of these emotions. Although research suggests that sleep disturbances can impact emotion regulation abilities, research has focused on clinical rather than community samples. Therefore, this study examined the association between ALEs and emotion dysregulation in a community sample of adolescents, and whether sleep disturbances moderated this relationship.
Methods: Participants were twin adolescents (N = 452; 50.8% female; 58.2% non-Hispanic White; 29.1% Hispanic/Latino) participating in a larger longitudinal study examining the influences of sleep and stressors on physical and mental health (Lemery-Chalfant et al., 2019). Twins completed questionnaires at the 13-year study wave (Mage = 13.62, SD = .95) including reports of total sleep disturbances over a typical week (Children's Report of Sleep Patterns; $\alpha = .79$; Meltzer et al., 2013), total adverse life events experienced (adapted Adverse Life Events Questionnaire; Tiet et al., 1998), and emotional dysregulation (Difficulties in Emotion Regulation Scale; $\alpha = .90$; Gratz & Roemer, 2004). To account for nested data (twins within families), a mixed-effects model was conducted in SPSS to examine the main effect of ALEs on emotion dysregulation, and whether sleep disturbances moderated this association. Covariates included age, sex, race/ethnicity, and socioeconomic status.
Results: ALEs ($b = .07$, $SE = .01$, $p < .001$) and sleep disturbances ($b = .74$, $SE = .07$, $p < .001$) each significantly predicted

greater emotion dysregulation, but sleep disturbances did not moderate the relationship between ALEs and emotion dysregulation (b = .02, SE = .02, p = .39).
Conclusion: Our findings suggest that interventions focused on increasing sleep quality and reducing ALEs may support adolescent emotion regulation. However, sleep did not serve as a moderator and our study was limited by cross-sectional self-report of sleep and retrospective self-report of adverse life events. Future research measuring sleep objectively may clarify whether typical sleep patterns (as opposed to sleep problems) may protect against emotion dysregulation for adolescents exposed to ALEs.
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0127

SLEEP PROBLEMS MEDIATE THE INDIRECT EFFECT OF ADVERSE CHILDHOOD EVENTS ON UNDERGRADUATES' PSYCHOLOGICAL FUNCTIONING

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Introduction: Adverse Childhood Events (ACEs) are highly prevalent, with two-thirds of U.S. adults reporting at least one ACE and one-sixth reporting four or more occurrences before age 18 (Rasmussen et al., 2023). Recent research further suggests that ACEs promote vulnerability to sleep problems, and with upwards of 60% of college students reporting deficient sleep (Lund et al., 2010), addressing the association between ACEs and college students' sleep is warranted. The need to address this issue is only increased by the robust links between poor sleep and mental health problems in college students (Peltz et al., 2019). Accordingly, the current study sought to clarify the prospective links between college students' ACEs and their psychological functioning via their levels of sleep disturbance.
Methods: Based on a 2-wave design (baseline and 2-month follow-up), the current study included a sample of 331 participants (86% female) who were assessed through an online survey. The sample's mean age was 21.3 years (SD = 2.4; range 18-34), and 65.9% of participants identified as white, with 18.4% Asian or Pacific Islander, 6.6% Latinx, 5.7% Black, and 3.3% multiracial or "other." Students' mean family income was $108,391 (SD = $62,579), with approximately 22% of students reporting family incomes of $50,000 or less and 16.3% with family incomes greater than $200,000.
Results: Mediation analyses, conducted using the PROCESS macro for SPSS (v. 4.3, Hayes, 2022), examined if ACEs predicted indirect, residual changes in psychological flexibility (i.e., a critical set of skills that alter the function of difficult or unwanted thoughts, emotions, and experiences in individuals' lives) via sleep disturbance. Controlling for students' reports of their sleep hygiene, sleep environment, gender, and socioeconomic status, results suggested ACEs were cross-sectionally associated with higher levels of sleep disturbance, which, in turn, predicted residual decreases in psychological flexibility across the 2-month period.
Conclusion: Given the influence of ACEs on college students' sleep and psychological functioning, findings highlight the importance of addressing the potential early impact of adversity on college students.
Support (if any):

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0128

LINKS BETWEEN BICULTURAL STRESS AND SLEEP PROBLEMS IN COLLEGE: THE ROLE OF CULTURAL CONGRUENCE AND SCHOOL BELONGING

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Introduction: Latino youth experience both physiological (i.e., sleep) and psychosocial health difficulties (i.e., bicultural stress), that are linked to adjustment. The current study focused on: 1) concurrent and longitudinal links between weekly bicultural stress, cultural promotive factors (cultural congruity, school belonging), and sleep problems; 2) whether cultural congruity and school belonging were protective between bicultural stress and sleep problems.
Methods: Participants were 181 Latino young adults(T1:Mage= 19.59; 32.8% male; 61.3% second generation immigrants; 67.4% first generation college students) at a large Southwestern public institution who completed surveys during their second (T1) and fourth (T2) year of college. Students reported on past-week bicultural stressors (T1), cultural congruity (T1; α=.80), school belonging (T1; α=.87), and sleep problems (T1, T2; PSQI).
Results: Cross-sectional regression analyses suggested that cultural congruity (b= -.82, p<.001), but not school belonging (b= -.58, p=.09) or bicultural stress (b=-.33, ns), were linked with concurrent sleep problems (T1). Further, there were no main effects of these variables on sleep longitudinally. There was a significant interaction between bicultural stress and school belonging in the prediction of concurrent sleep problems. Youth with high school belonging exhibited a significant positive association between bicultural stress and sleep problems, while bicultural stress and sleep problems were negatively linked for students with low levels. There was also a significant interaction between bicultural stress and cultural congruity in the prediction of sleep problems two years later. Youth with high cultural congruence had a negative link between bicultural stress and sleep problems, while associations were not significant for youth with low levels.
Conclusion: We found that cultural congruity was a promotive factor such that higher levels were linked with fewer sleep problems. Greater school belonging exacerbated the effects of bicultural stress on sleep problems, suggesting that those youth may be more reactive to bicultural stressors. Students high in cultural congruity who experienced higher bicultural stress had greater decreases in sleep problems two years later. Future interventions should focus on the roles of belonging and cultural fit when examining Latino students' stress and sleep health in college.
Support (if any):

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0129

THE ROLE OF ALERTNESS IN COGNITIVE AND AFFECTIVE EMPATHY

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Introduction: Lack of sleep may harm the ability to accurately identify and experience others' emotions. Yet it is unclear what outcome of sleep disruption is responsible for these effects. Specifically, can decreased alertness, a key outcome of insufficient sleep, help explain less empathizing? To this end, three

studies tested the hypothesis that higher alertness foreshadows better empathic accuracy and higher empathic concern.
Methods: College-age participants took part in three studies (N's of 227, 269, and 823). In all three studies, participants first reported on their subjective alertness using the Karolinska Sleepiness Scale and completed a 10-min Psychomotor Vigilance Test (PVT) to gauge their objective alertness. To measure cognitive and affective empathy, participants completed the Multifaceted Empathy Test (MET) where they had to accurately identify emotions from facial expression portraits (cognitive empathy) and report their empathic concern for each one (affective empathy). Study 2 was a replication of Study 1 using more diverse stimuli. In Study 3, some participants were randomly assigned to ingest 300 mg of caffeine before completing the tasks to experimentally increase their alertness (or received a placebo), and all participants completed an additional measure of affective empathy (Pictorial Empathy Test).
Results: In studies 1 and 2, slower response time on the PVT was significantly associated with lower levels of empathic concern (e.g. r= -.19, Study 1). Across all three studies, PVT lapses (e.g. r= -.24, Study 2) and false starts on the PVT, were significantly associated with poorer empathic accuracy (e.g. 1 r= -.31, Study 1). In study 3 those in the caffeine-administration group were more objectively alert and reported significantly higher affective empathy, measured by the pictorial empathy test (with only a trend on the MET), then the placebo and control group (d= .19).
Conclusion: These findings provide robust evidence that implicates lower alertness as a predictor of muted empathic responding and suggests alertness may support both cognitive and affective empathy. Changes in alertness may help explain how sleep disruption undermines individuals' ability to empathize.
Support (if any):

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0130

NEGATIVE PEER INTERACTIONS AMONG ADOLESCENTS ARE ASSOCIATED WITH MORE DIFFICULTY SLEEPING

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Introduction: Adolescence is a turbulent time for sleep health and social and psychological well-being. Adolescents commonly experience negative peer interactions and relationships. Few studies have investigated the associations of physical bullying and social exclusion with sleep, and those that have done so are not generalizable across the United States. The aim of this study was to assess whether negative peer interactions were related to sleep problems among a national, diverse sample of adolescents.
Methods: Data were from the age 15 wave of the Future of Families and Child Wellbeing Study, a longitudinal birth cohort of adolescents from 20 US cities. Adolescents self-reported whether they experienced different forms of bullying (i.e., being picked on, hit or threatened with physical violence, or purposely excluded) and the number of nights they experienced having difficulty falling or staying asleep throughout the week (N=3,305). Poisson regression analyses for each sleep outcome were adjusted for age, sex, race/ethnicity, family socioeconomic status, family structure, and caregiver education level.
Results: About 16% of the sample reported experiencing some form of bullying, and about half reported no nights with difficulty falling or staying asleep. Adolescents who were picked on reported 30% more nights with difficulty falling asleep ($p< 0.001$) and 39% more nights with difficulty staying asleep ($p< 0.001$). Those who reported being hit or threatened with physical violence reported 27% more nights with difficulty falling asleep ($p< 0.001$) and 44% more nights with difficulty staying asleep ($p< 0.001$). Adolescents who were purposely excluded from activities reported 19% more nights with difficulty falling asleep ($p< 0.001$) and 38% more nights with difficulty staying asleep ($p< 0.001$).
Conclusion: Results support our hypothesis that negative peer interactions at schools across the US are associated with more nights with difficulty falling or staying asleep. If adolescents are already at risk for difficulty sleeping, experiencing bullying may further exacerbate risk. Schools should therefore identify and attempt to prevent negative peer interactions to protect adolescent sleep health and well-being.
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0131

DEPRESSION, ANXIETY, STRESS, SLEEP QUALITY, AND PERCEIVED ACADEMIC PERFORMANCE IN COLLEGE STUDENTS

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Introduction: There is a significant amount of research which suggests that college students who exhibit poor sleep quality tend to have worse academic performance. Additionally, studies have shown correlations between stress levels and academic performance. In the current study, it was expected that college students with higher stress levels and lower sleep quality would report worse perceived academic performance.
Methods: Participants included 130 (male=21) full-time undergraduate students (mean age=19.65, SD=1.54 years). Participants completed an online survey that consisted of a series of questionnaires that examined demographics, perceived levels of academic performance, depression, anxiety, stress (Depression Anxiety Stress Scale; DASS-21), and sleep quality and duration (Pittsburgh Sleep Quality Index, PSQI).
Results: Preliminary data analyses were conducted. Average sleep duration (PSQI) was 7.00 hours per night (SD=1.36) and sleep quality (PSQI) was poor (M=6.86, SD=3.33). Mean depression (M=21.66) and stress (M=28.46) scores fell into severe categories, whereas anxiety scores (M=23.06) were extremely severe. Pearson correlations revealed that depression ($r=.472$, $p<.001$), anxiety ($r=.419$, $p<.001$), and stress ($r=.527$, $p<.001$) were related to sleep quality. A One-Way ANOVA ($F(4, 124)=2.507$, $p=.045$) revealed that students who perceived making all A's had the best sleep quality (M=5.22) compared to those who perceived making mostly A's (7.00) or A's/B's (7.57). Depression, anxiety, and stress were not significantly related to perceived academic performance.
Conclusion: Higher rates of depression, anxiety, and stress were associated with poorer sleep quality. Students with better sleep quality perceived better academic performance compared to those with poorer sleep quality. A ceiling effect may have

occurred with stress, potentially explaining the lack of relationship with perceived academic performance. Limitations include preliminary data analyses and the surveys were completed by participants within the last three weeks of the semester. The end of the semester likely contributed to high levels of stress and anxiety.
Support (if any): None.

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0132
EFFECTS OF SLEEP BEHAVIOR, OBESITY, AND SEX ON WELL-BEING AND MENTAL HEALTH PROBLEMS IN ADOLESCENTS

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Introduction: Poor sleep and mental health problems commonly emerge in adolescence, with a higher prevalence in females and those who suffer from obesity. Here, we evaluated the complex associations between poor sleep, obesity, and biological sex and how they interact to influence wellbeing in a large, diverse cohort of adolescents in the US.
Methods: Data were analyzed from 7,261 adolescents (Year 2: Mean age=11.94 years, range: 10-14 years, 47.3% female), collected as part of the ongoing ABCD Study®. Sleep duration was assessed with the Munich Chronotype questionnaire (youth-report), and sleep quality was assessed with a question about having trouble falling or staying asleep in the past two weeks from the Kiddie Schedule for Affective Disorders and Schizophrenia (KSADS-5) (youth-report). Internalizing and externalizing problems were assessed using the Child Behavior Checklist (caregiver-report). Positive affect was assessed with the NIH-toolbox measures. Regression models examined associations between obesity (>95 body mass index percentile), sleep behavior and mental health, considering sex differences, age, and socio-demographic characteristics.
Results: Short sleep duration and poorer sleep quality, as well as obesity were associated with higher internalizing ($p<.01$) and externalizing ($p<.01$) problems. Adolescents with obesity and prolonged sleep duration had higher internalizing ($p=.01$) and externalizing problems ($p<.01$). Shorter sleep duration ($p<.01$) and poorer sleep quality ($p=.01$) were associated with lower positive affect, with stronger effects in female adolescents. Obesity partially mediated the association between sleep problems and positive affect ($p<.01$).
Conclusion: This study demonstrates a strong link between sleep, obesity, and mental health outcomes in adolescents, highlighting significant sex differences. Poor sleep quality and obesity is related to more internalizing and externalizing problems and lower positive affect, with notable with notable impacts on female adolescents. These findings highlight the importance of addressing sleep and obesity in adolescent mental health interventions, recognizing the unique vulnerabilities and needs of male and female adolescents and those with obesity.
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0133
THE IMPACT OF STRESS AND SLEEP: CAPTURING MULTIDAY PATTERNS

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Introduction: Students commonly experience stress due to constant academic demands and societal pressures. This study aims to investigate whether there are differences in sleep efficiency among students experiencing high, low, and medium levels of stress. We performed statistical analyses on sleep efficiency across various stress levels to investigate how stress affects daily sleep patterns.
Methods: Using the GLOBEM dataset, we computed the range of daily sleep efficiency scores for individual students, considering their highest and lowest sleep efficiency levels observed throughout the study. We classified days into high, medium, and low-stress categories based on students' weekly Perceived Stress Scale 4 (PSS-4) survey scores. We focused on sleep efficiency ranges within each stress group, emphasizing the significance of considering variability alongside average values to uncover distinct sleep patterns. A one-way analysis of variance (ANOVA) was employed to examine variations in sleep efficiency ranges among different stress groups. Subsequently, Tukey's post hoc analysis was conducted to identify specific groups that exhibited differences in their sleep efficiency.
Results: No statistically significant differences were observed in daily sleep efficiency scores among students with high, medium, and low stress levels. However, we identified significant variations in sleep efficiency ranges (ANOVA $F(2) = 18.14$, $p < 0.0000001$). Post-hoc Tukey analysis revealed mean differences, indicating a significant increase in sleep efficiency ranges between high and low-stress groups ($p = 0.0$) and a significant increase between high and medium-stress groups ($p = 0.0$). Notably, no statistically significant difference was found between the low and medium-stress groups. The instances of high-stressed days (N=140), medium-stressed days (N=2271), and low-stressed days (N=1615) provide context to these findings highlighting variations in sleep efficiency.
Conclusion: A significant correlation between stress severity and sleep efficiency does not exist at the day level. However, when we looked at variations in sleep efficiency over time, there are statistical significant differences that correlate with stress severity. The increase in sleep efficiency ranges among high-stress students indicates that they don't consistently experience poor sleep efficiency but rather exhibit more erratic sleep patterns. This underscores the importance of considering stress severity when analyzing and addressing sleep patterns in students.
Support (if any):

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0134
DIURNAL PATTERNS IN SOCIAL BELONGING AND PERCEIVED BURDENSOMENESS AMONG YOUNG ADULTS

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Introduction: Suicide is the second-leading cause of death among young adults. Feelings of thwarted belongingness and perceived burdensomeness may accompany or precipitate suicidal thoughts. It is unclear how these negative cognitions vary across the day.
Methods: Individuals aged 18-25 (N=143) participated in a week-long ecological momentary assessment study of sleep (measured by daily sleep diaries) and feelings of social belonging and perceived burdensomeness (measured by text message surveys sent five times per day). Each dimension was assessed by three questions with ratings from 1 (not true at all for me) to 7 (very true for me). Text surveys were scheduled across the day (roughly at 2AM, 7AM, 12PM, 5PM and 10PM), and responses were categorized by whether the individual reported suicidal ideation at that time or not.
Results: A total of N=3442 text surveys were collected from N=134 participants. Participants provided an average of 26 of 35 possible surveys (SD=8.3). Non-ideators reported consistently elevated feelings of social belonging (5.41 out of 7, SD=1.71) and consistently low feelings of perceived burdensomeness (1.54 out of 7, SD=1.13). Suicidal ideators, however, reported generally low social belonging (2.8 out of 7, SD=1.84) and elevated perceived burdensomeness (4.31 out of 7, SD=1.99). Two-way ANOVAs found that social belonging varied significantly by suicidal ideation ($p < 0.001$) and marginally for time by suicidal ideation ($p = 0.069$). Perceived burdensomeness varied only by suicidal ideation ($p < 0.001$); there was no significant interaction of time by suicidal ideation.
Conclusion: Feelings of social belonging and perceived burdensomeness varied substantially only for individuals experiencing suicidal ideation, and only marginally over time among suicidal ideators. Additional work is needed to determine how sleep continuity and regularity may influence these findings.
Support (if any):

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0135

ASSOCIATION OF CIRCADIAN MISALIGNMENT WITH INTERNALIZING SYMPTOMS AND EXTERNALIZING BEHAVIORS IN ADOLESCENTS

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Introduction: Biological changes during adolescence naturally delay the circadian sleep-wake cycle. Adolescents struggle between the imposed timing of their sleep-wake cycle by social demands and their desired one, resulting in circadian misalignment. Circadian misalignment has been associated with a higher risk for mental health problems. We examined whether objective and subjective metrics of circadian misalignment are associated with internalizing symptoms (IS) and externalizing behaviors (EB) in adolescents.
Methods: We studied 376 adolescents from the Penn State Child Cohort (median 16 years; 47% female; 21% racial/ethnic minority) who had a minimum of 3-nights of at-home actigraphy (ACT), and 9-h in-lab polysomnography (PSG). ACT-measured sleep midpoint (SM) was calculated as the central point of the sleep period, while sleep regularity (SR) was calculated as the intra-individual standard deviation of the SM. Circadian preference (CP) was measured with the Morningness-Eveningness Questionnaire. IS and EB were measured by parent- or self-report on Achenbach System of Empirically Based Assessment using developmentally-appropriate forms and norms. Stepwise linear regression models adjusted for demographics (sex, race/ethnicity, age, BMI percentile), sleep disorders (insomnia, PSG-apnea/hypopnea index) and insufficient sleep (ACT-mean sleep duration, ACT-sleep duration variability).
Results: Both CP ($r=-.118$, $p=.022$) and SR ($r=.116$, $p=.024$) were associated with IS, however, they competed between each other in regression models resulting in marginally significant associations ($\beta=-.094$, $p=.079$ and $\beta=.092$, $p=.084$, respectively) that were further attenuated after adjusting individually for covariables ($\beta=-.072$, $p=.190$ and $\beta=.076$, $p=.163$, respectively). Both CP ($r=-.230$, $p<.001$) and SR ($r=.140$, $p=.006$) were associated with EB; however, only CP ($\beta=-.153$, $p=.004$) remained significantly associated with EB after adjusting for covariables ($\beta=-.130$, $p=.016$).
Conclusion: Assessing self-reported eveningness is a useful and inexpensive tool to identify adolescents in whom circadian misalignment contributes to mood and behavioral problems. However, it appears that its combination with objective assessments, particularly irregularity of the sleep-wake cycle, may yield the most predictive results.
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0136

DIURNAL PATTERNS IN SUICIDAL THINKING AMONG YOUNG ADULTS

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Introduction: Suicide is the second-leading cause of death among young adults. Disrupted sleep and circadian rhythms may contribute to the risk of suicide in this age group. Nocturnal wakefulness, for example, may create changes in brain function that contribute to increased incidence of suicide. However, there are limited data on whether suicidal cognitions vary across the day.
Methods: A sample of N=143 individuals aged 18-25 were recruited to participate in a week-long ecological momentary assessment study of sleep and suicidal thoughts. Sleep was sampled daily using a sleep diary, and suicide-related cognitions were sampled five times per day using automated text messages. Text surveys were scheduled across 24 hours (roughly at 2AM, 7AM, 12PM, 5PM and 10PM) and grouped into 6-hour bins (2300-0459, 0500-1059, 1100-1659, 1700-2259). Individuals with unusual or elevated levels of suicidal ideation were followed-up by study personnel for safety.
Results: A total of N=3442 text surveys were collected from N=134 participants. Participants provided an average of 26 surveys each (SD=8.3). A total of N=93 (2.8%) of surveys reported suicidal ideation. As a proportion of all surveys, suicidal ideation was most prevalent from 2300-0459 (N=18, 3.2%) and least from 0500-1059 (N=20, 2.2%). Among suicidal ideators, the desire to die was most elevated from 1100-1659 (1.8 out of 4, SD = 1.19), the intention to die was greatest from 1100-1659 (0.9 out

of 3, SD=0.8), and the ability to resist the urge to die was lowest in the 0500-1059 (3.1 out of 4, SD=1.12). However, there were no statistical differences across time categories for the presence of suicidal ideation or severity/intensity of these thoughts.
Conclusion: Suicidal ideation was measured in nearly every hour of the 24-hour day, and severity of suicidal ideation appeared to fluctuate over time. Nevertheless, the presence of suicidal ideation and its severity did not differ statistically across the day, likely due to the small number of reported suicidal cognitions across the sample. Additional work will examine how sleep continuity and/or regularity may influence these findings.
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0137
EXPLORING THE NEXUS OF SLEEP RESTLESSNESS AND DEPRESSIVE SYMPTOMS : A STUDY OF VENEZUELAN DYADS IN THE U.S

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Introduction: Sleep is a critical component of overall well-being, influencing physical health, cognitive function, and emotional stability. In the context of mental health, sleep disturbances, particularly restlessness, have been identified as potential indicators of psychological distress. In the Venezuelan population, understanding the relationship between sleep, mental health, and familial dynamics is of paramount importance. The continued difficulties in Venezuela and the migration process for these immigrants may contribute unique factors influencing sleep patterns and mental well-being. This study aims to delve into the relationship between self-reported sleep restlessness, as indicated by responses to CES-D question 4, and depressive symptoms among Venezuelan parents and their children.
Methods: The investigation employed a two-wave design to capture the dynamics of these associations over time. Participants completed surveys at two distinct time points, Time Point 1 and Time Point 2, providing data on sleep restlessness (specifically, CES-D question 4) and overall depressive symptoms assessed by the Center for Epidemiological Studies Depression Scale (CES-D).
Results: In Wave 1, parental reports indicated that 17% experienced restless sleep moderately or all of the time (n=27), while 38% reported some or little restlessness (n=60). Among adolescents, 22% reported moderately restless or almost all the time (n=35), and 28% reported some or little restlessness (n=43). The CES-D scores revealed a concerning trend among parents, with a mean score of 19, surpassing the clinical depression cut-off. Approximately 75% of parents scored 26 or higher on the CES-D, indicating a substantial prevalence of depressive symptoms. Adolescent mean CES-D scores were 21, and a noteworthy 94.3% scored 16 or above, reflecting a significant proportion experiencing elevated depressive symptoms. Persisting into Wave 2, the scores and reported restlessness among both parents and adolescents remained consistent, suggesting that these symptoms endured over time without significant mitigation.
Conclusion: This study provides a comprehensive examination of the enduring relationship between sleep restlessness and depressive symptoms among Venezuelan parents and their children living in the United States. The findings underscore the significant prevalence of restlessness and depressive symptoms within this population, revealing a concerning pattern that persists over a two-wave study period.
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0138
EFFECTS OF SLOW OSCILLATION ENHANCEMENT DURING NREM SLEEP USING CLOSED-LOOP AUDITORY STIMULATION ON ANXIETY

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Introduction: Sleep is associated with emotions. Recently, some evidences demonstrated that longer slow-wave sleep (SWS) or higher slow-wave activity (SWA) is associated with the greater anxiety reduction, which is an emotion (Horvath et al., 2015; Ben Simon et al., 2020). Slow oscillations (SOs) (< 1 Hz), which are mainly observed during SWS, are essential hallmarks of SWS. We hypothesized that enhancing SOs and SWA during non-rapid eye movement (NREM) sleep could reduce anxiety in highly anxious individuals. A previous study established non-invasive closed-loop auditory stimulation (CLAS) to enhance SOs during NREM sleep (Ngo et al., 2013); furthermore, CLAS increases SWA (Krugliakova et al., 2020). The present study aimed to investigate whether CLAS during NREM sleep to enhance SOs could reduce anxiety in healthy, highly anxious adults.
Methods: Sixteen healthy adults (23.9±3.7 years, six women) with trait-anxiety scores of 45–80 on the state-trait anxiety inventory (STAI) were included. A single-blind crossover test was conducted with two conditions; the SOs were tracked from the electroencephalography (EEG) and sounds were presented by CLAS (STIM) and the SOs were tracked but no sounds were presented (SHAM). On each experimental day, the participant was attached a polysomnograph and additional EEG for CLAS, which analyzes the EEG in real-time. Participants completed questionnaires, which included state-anxiety scores from the STAI, Profile of Mood States Second Edition (POMS2), and Positive and Negative Affect Scale (PANAS). Participants slept for 8 h, and once awakened, they completed the same questionnaires before sleeping.
Results: There was no difference in STAI scores and POMS2 and PANAS between the two conditions (STIM or SHAM).
Conclusion: Contrary to the hypothesis, SOs enhancement during NREM sleep by CLAS did not relieve anxiety. It may be due to the small effect of CLAS on anxiety for a one-night study in healthy young adults. Eventually, we should investigate whether CLAS intervention over multiple nights improves anxiety.
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0139
TESTING THE MOOD REGULATORY HYPOTHESIS OF DREAMING

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Introduction: Dreaming has been theorized to facilitate fear extinction learning in a manner akin to desensitization therapy. A testable hypothesis from this theory is that the experience of fear in dreams leads to lower subsequent daytime negative affect. This study employed a novel natural language processing tool and multilevel modeling to test whether fear in dreams led to reductions in negative affective the next day.
Methods: Data from 553 participants (4986 observations) were analyzed from a larger online daily survey study of sleep and mental health from Boston College. Participants completed multiple days of dream reports and measures of daytime negative affect and sleep efficiency. Dream fear was estimated using a novel deep learning natural language processing model trained on fear-annotated tweets, applied to participants' dream report text. We fitted a Bayesian zero-inflated negative binomial multilevel model to estimate within- and between-person effects of dream fear on next-day negative affect while controlling for sleep efficiency, dream report word count, the difference between time of survey completion and time awake, total number of dreams per subject, and neuroticism.
Results: The analysis revealed that days with higher dream fear within individuals were associated with higher next-day negative affect, controlling for other variables. Specifically, for each standardized increase in dream fear, a 14% increase in next-day negative affect was predicted, surpassing the effect of poor sleep efficiency (6% increase). Moreover, individuals consistently reporting higher average dream fear tended to exhibit higher average negative affect (12%).
Conclusion: Contrary to the proposed hypothesis that dream fear regulates daytime mood, we found that fearful dreams may lead to lower next-day mood. Nights higher in dream fear were associated with increased next-day negative affect for that person, independent of sleep efficiency and neuroticism. Notably, dream fear appeared to contribute more than twice as much as poor sleep efficiency to heightened negative affect. Leveraging advanced natural language processing and multilevel modeling, this research increases our understanding of the ways dream experiences affect waking life by showing that fearful dreams may be an important day-to-day predictor of mood. Future work should explore dynamic relationships between dream emotions and mood.
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0140

THE RELATIONSHIP BETWEEN REM SLEEP PRIOR TO ANALOGUE TRAUMA AND INTRUSIVE MEMORIES

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Introduction: Intrusive memories are a core feature of post-traumatic stress disorder (PTSD). They both predict the onset of the disorder and drive broader PTSD symptomology. Three meta-analyses concluded sleep (vs wake) after exposure to an analogue trauma decreases the likelihood of intrusive memories. However, the role of sleep prior to analogue trauma exposure has not yet been examined. This is important, insomnia, OSA, and shift work prior to trauma exposure increases the risk of PTSD 2.5-3.0 fold. Given the role of REM sleep in emotion regulation, REM sleep prior to trauma exposure may be particularly critical in the development of intrusive memories. Here, we examined the association between REM sleep prior to analogue trauma and intrusive memories.
Methods: To manipulate REM sleep, 27 healthy adults (MAge = 25.4, SD = 2.89, 56% Female) were randomised to either to a circadian misalignment (CM) condition or normal control (NC) condition for four nights. In CM, participants slept normally for two nights followed by a 4-hour phase advance on night three and an additional 4-hour phase advance on night four. In NC, participants had 8-hour sleep opportunities each night. On day 5, participants watched a trauma film and kept an intrusive memory diary for the next three days. Analyses focused on the relationship between REM sleep over 4 nights in the lab and subsequent intrusive memories.
Results: Greater REM sleep percentage ($p = .004$) and REM efficiency ($p = .02$) across 4 nights prior to analogue trauma, independent of group, were significantly associated with fewer intrusive memories in the 3 days after viewing the film.
Conclusion: Findings suggest REM sleep may serve to protect individuals against experiencing intrusive memories. This is consistent with evidence suggesting REM sleep influences emotional memory regulation. Occupations (e.g., emergency services/military personnel) who experience circadian disruptions likely to decrease REM sleep (e.g., from shift work) may be at heightened risk of experiencing intrusive memories after trauma exposure, and thus at increased risk of developing PTSD.
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0141

NIGHTTIME NAPPING DAMPENS DAILY PEAK OF SLEEPINESS IN SIMULATED NIGHT SHIFT SCHEDULES WITH RESTRICTED DAYTIME SLEEP

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Introduction: Night shift workers experience increased sleepiness during the night due to increasing homeostatic sleep drive and reduced circadian wake drive, and because their daytime sleep is typically restricted. Nighttime napping is a countermeasure to sleepiness, but the effectiveness of different amounts of nighttime nap sleep in night shift schedules with restricted daytime sleep has not been systematically investigated.
Methods: N=79 healthy adults (ages 28.5±6.8y; 53 males) participated in a laboratory study with 8 days of simulated night shift. Subjects were randomized to one of 18 daily sleep regimens involving restricted daytime sleep (4.2h, 5.2h, 6.2h, or 8.2h TIB centered at 14:00) combined with a nighttime nap (0h, 0.4h, 0.8h, 1.2h, 1.6h, 2.0h, or 2.4h TIB centered at 02:00). Every day at 20:10, 22:10, 00:10, 04:10, 06:10, 08:10 (all post sleep inertia), subjective sleepiness and vigilant attention were assessed with the Karolinska Sleepiness Scale (KSS) and Psychomotor Vigilance Test (PVT), respectively. For each subject, circadian change was determined as the difference between the daily peak and trough of KSS scores and PVT lapses (RT>500ms). Daily peak sleepiness and circadian change were analyzed using mixed-effects regression with fixed effects for nighttime nap TIB (categorical), night shift day, and their interaction; covariates for daytime sleep TIB (categorical) by itself and in interaction with day; and a random effect over subjects on the intercept.
Results: Nap duration influenced KSS daily peak ($F[6,543]=2.25$, $P=0.037$) and circadian change ($F[6,543]=3.18$, $P=0.005$), with 0h TIB (no nap) yielding the highest peak and circadian change ($P< 0.05$), 0.8h TIB the lowest ($P< 0.05$), and no significant differences comparing the other nap durations. Nap duration did not significantly affect PVT daily peak impairment ($P=0.36$) or circadian change ($P=0.16$).
Conclusion: Nighttime napping of any duration (0.4h–2.4h TIB) centered at 02:00 has the potential to mitigate peak subjective sleepiness during night shift schedules with restricted daytime sleep. This napping effect does not appear to extend to impairment in objectively measured vigilant attention. More research is needed to understand the extent to which performance and safety benefit from nighttime napping under conditions of sustained daytime sleep restriction during night shift schedules.
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0142

EVALUATING THE EFFICACY OF LIGHT AND ODOUR FOR MITIGATING SLEEP INERTIA UNDER CONDITIONS OF SLEEP RESTRICTION

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Introduction: Sleep inertia (SI) poses challenges in safety-critical and high-performance environments. Sleep restriction is known to exacerbate SI. To minimise the experience of SI under conditions of sleep restriction, we assessed the role of two quick and easily implementable reactive countermeasures – light and odour – to increase alertness on waking.
Methods: N=31 (20F, 25.13±5.72y, 24.36±2.1kg/m2) were monitored at home for a week with actigraphy and then in the laboratory underwent an initial night of 7h, followed by 4 days where sleep was split across a 4h sleep opportunity at night and a 1h daytime nap, with a final night of 8h TIB for sleep. Participants were randomly allocated to one of three groups - control, light, or odour. The group allocation determined the countermeasure received on waking before commencing a battery of tests. Performance during SI was assessed using the Psychomotor Vigilance Test (PVT), and the Karolinska Sleepiness Scale (KSS) at 3, 18, 33, 48, and 63min after awakening. Outcomes included reciprocal median reaction time (RRT) and lapses (RT>500ms) on the PVT, and KSS scores. Data were analysed with mixed-model ANOVAs with condition, time since awakening, time of day, and day as fixed factors, and participant as a random factor, and posthocs simple effects analysis.
Results: There were significant time awake by time-of-day interactions on PVT RRT and PVT Lapses $p<.05$ and a main effect of time awake and time-of-day for KSS ($p<.05$). Faster RRTs and fewer Lapses were found across the afternoon wake (i.e., afternoon nap) SI period compared to the morning wake (i.e., night sleep). The progress through the SI period was consistent across time of day for KSS. Condition had no significant main effect or interaction effect with time awake onto measures of SI (e.g., RRT, Lapses, and KSS) ($p>.05$)
Conclusion: These findings indicate that light and odour for a short period at waking do not improve SI under conditions of sleep restriction. Instead, the findings indicate that a daytime nap may reduce the exacerbating effects of sleep restriction preventing the accumulation of SI during a 4-day simulated work week.
Support (if any): Naval Postgraduate School

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0143

EFFECTS OF OPTIMAL-TIMED AUTOMATIC AWAKENING FROM A SHORT DAYTIME NAP ON COGNITIVE PERFORMANCE AND FATIGUE

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Introduction: Daytime naps, although known to improve performance, can impair performance if overextended, as slow-wave sleep causes sleep inertia. Hayashi et al. (2014) showed that a nap duration of 9 min after N2 onset maximized performance. However, awakening 9 min after N2 is challenging, other than in sleep laboratories, because it requires manual polysomnography (PSG) scoring. We developed a system that automatically awakens 9 min after N2 by an automatic sleep stage estimator using a blood flow meter and investigated whether this improved performance, sleepiness, and fatigue compared to no napping and also its effectiveness as compared to manual awakening.
Methods: Eighty-one healthy adults (33.6±12.8 years [mean ± standard deviation], 47 women) were randomly assigned to three groups of 27 participants each: automatic awakening, manual

awakening, and rest. The digit symbol substitution test (DSST) was used to evaluate cognitive speed and visual detection task (VDT) to evaluate attention. The Karolinska Sleepiness Scale and the visual analog scale were used for the sleepiness and fatigue evaluation; the tasks were performed thrice after attaching the PSG and used as a baseline. The automatic and manual awakening groups napped wearing the blood-flow-meter device. The latter group was awakened 9 min after the N2 onset. The participants in the rest group remained awake for 22 minutes. After the nap or rest, the task was performed again for six sessions consisting of three times tasks. Groups were compared for the changes detected from the baseline in each session.

Results: The automatic awakening group woke up 19.6 ± 6.0 (mean ± standard deviation) [min-max 7.9–27.1] min from N2. Subjective sleepiness and fatigue in the automatic awakening group decreased compared to the rest group in all sessions and were comparable to those in the manual awakening group; the number of correct answers on the DSST increased in the sixth session for manual awakening compared to rest. VDT did not differ between groups.

Conclusion: Napping with the automatic awakening device improved sleepiness and fatigue comparable to manual awakening.

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0144

THE IMPACT OF CONTROLLED REST ON NEUROBEHAVIORAL OUTCOMES AT TOP-OF-DESCENT

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Introduction: Long and irregular working hours can lead to fatigue in aviation operations. In some regions, a short nap taken on the flight deck (known as controlled rest) can be used as a countermeasure to unexpected in-flight sleepiness. We aimed to investigate the impact of taking controlled rest on neurobehavioral measures at top-of-descent.

Methods: Data from 120 long-haul (> 6 h flight duration), unaugmented flights were analyzed (n = 31 pilots). Pilots wore actigraphs and completed sleep logs before and during trips. At pre-flight and top-of-descent, pilots completed a 5-minute psychomotor vigilance task (PVT) and Karolinska Sleepiness Scale (KSS). A series of mixed-effects models were conducted to assess the impact of controlled rest on outcome measures at top-of-descent. Sleep duration in the prior 48 hours, timing of the flight, and pre-flight scores for each measure were included as covariates.

Results: Due to missing data, complete data from 76 flights (n = 28 participants) were available in the models examining the PVT metrics, and data from 83 flights (n = 29 participants) were available in the analyses of the KSS. Pilots who took controlled rest had faster response speeds at top-of-descent ($p = .03$, $\eta 2p = 0.07$; estimated marginal mean [EMM] = 4.19, standard error [SE] = 0.07, 95% CI [4.08, 4.29]) than those who did not take controlled rest (EMM = 4.00, SE = 0.05, 95% CI [3.86, 4.14]). There were no differences by controlled rest status for KSS scores and PVT lapses (p values $> .05$, $\eta 2p$ values ≤ 0.01).

Conclusion: Our results suggest that taking controlled rest may improve vigilant attention at critical phases of flight and, thus, may be a useful fatigue management tool during unaugmented flights. Further research is necessary to determine the impact of factors on the decision to take controlled rest (e.g., airline culture, personal preference) and how the controlled rest policy is applied in practice.

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0145

WORSENING ESS THRESHOLDS PREDICT FIVE-YEAR MORTALITY RISK: AN NLP-INFORMED MODEL

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Introduction: The Epworth Sleepiness Scale (ESS) is a validated tool for capturing self-reported excessive daytime sleepiness. We examined thresholds for association between ESS changes and risk of 5-year all-cause mortality.

Methods: ESS values were mined from progress note-derived free form texts using a natural language processing (NLP) pipeline with reported accuracy of 91%. Veterans in the VHA diagnosed with a sleep disorder or who had participated in a sleep study from January 13, 2000, to August 13, 2018, and with two exams at least 12 weeks apart were identified. Patients were categorized as having normal (0-10) or abnormal (11-24) ESS and characterized by changes in ESS over time: normal-normal, normal-abnormal, abnormal-abnormal, and abnormal-normal. Cox proportional hazards models and elbow plots were conducted to evaluate magnitude of and thresholds for risk of 5-year all-cause mortality adjustment for age and sex.

Results: At baseline, qualifying Veterans were mostly white (74.2%) and male (92.2%) with a mean age of 55.8 ± 13.3 (N = 21,605). One quarter experienced all-cause mortality within five years of their second exam (25.9%). Veterans with abnormal ESS at the second exam had a 6% greater risk of five-year all-cause mortality (aHR: 1.06; 95%CI:1.00,1.11) than those with normal ESS, after adjusting for age and sex. Mortality risk was 13% higher among those converting from normal-abnormal (aHR: 1.13; 95%CI: 1.08,1.32), compared to normal-normal, particularly among those 60 years (aHR: 1.20; 95%CI:1.08,1.32), after adjustment. Regardless of baseline ESS, participants whose score increased over 3-points had significantly higher risk of five-year mortality compared to lesser changes (aHR: 1.08; 95% CI: 1.01, 1.16), which was intensified among those 60 years of age and over (aHR: 1.14, 95% CI: 1.05, 1.23), after adjustment.

Conclusion: These results suggest that abnormal ESS may serve as a clinical marker for increased risk of 5-year all-cause mortality. Providers should pay particular attention to ESS increases over 3-points, particularly among those 60 and older.

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0146

SUPINE SLEEP POSITION AND ANGINA EPISODES: THE SLEEP HEART HEALTH STUDY

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Introduction: Poor sleep features are associated with an increased risk of cardiovascular disease (CVD). While habitual sleep postures may influence cardiovascular function, previous studies have mainly focused on the benefits of left-side sleeping during pregnancy and different sleep positions in relation to musculoskeletal symptoms. It remains largely unknown how the supine position is associated with cardiovascular risk in general populations. The purpose of this study was to examine the association of supine position with angina episodes, the most common symptom of ischemic heart disease.
Methods: This study used data form the Sleep Heart Health Study (SHHS). Sleep position was operationalized as a percentage of total sleep duration in the supine position, measured by unattended home polysomnography (PSG) during SHHS visit 1. Angina was defined as the number of episodes from baseline PSG to SHHS visit 2. Multiple regression analysis was conducted with covariates including age, race, gender, body mass index, smoking status, systolic blood pressure, history of diabetes, total sleep duration, sleep efficiency, apnea hypopnea index, hypertension medication, diabetes medication (oral or insulin), lipid medication, cholesterol, triglyceride, HDL, and psychological stress, obtained during the SHHS visit 1.
Results: The study included a total of 4458 participants (2363 females, 53%) with mean age of 64.33 years old and a mean systolic BP of 125 mmHg. The mean of supine position was 33.64% and the mean number of angina episodes was 0.54. The supine position was an independent predictor of the number of angina episodes (p=<.001). A one standard deviation increase in the supine position resulted in 0.076 standard deviations increase in the number of angina episodes (β=.076), while age and body mass index resulted in .077 and .098 increase in the outcome (β = .077, p=<.001; β = .098, p=.<.001).
Conclusion: Sleeping in the supine position was significantly associated with the number of angina episodes. However, the current study lacks specific information regarding the percentage of sleep duration in non-supine positions (either left/right side or prone position). Identifying sleep positions optimal for facilitating cardiovascular function may make a meaningful contribution to CVD prevention.
Support (if any):

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0147

SOCIAL JETLAG AND POOR SLEEP QUALITY PREDICT WORSE GRADES IN FIRST-YEAR COLLEGE STUDENTS

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Introduction: Poor sleep is common amongst college students and is hypothesized to negatively impact academic performance. However, much of the work on this topic has been cross-sectional and not accounted for fluid intelligence or baseline mental health, thereby limiting understanding of causal direction. In the current work, we examined whether sleep duration, quality, and timing in the first year of college were predictive of end-of-year grade point average (GPA) when accounting for known predictors such as demographics, mental health, and fluid intelligence.
Methods: First year college students (N=491, Mage=18.3; 71.1% female; 54.5% non-white; mean ACT=29.6) were recruited to complete a baseline session that included measures of sleep quality (PSQI), social jetlag (difference in midpoint of sleep across weekdays and weekends), chronotype (morningness-eveningness questionnaire), daytime sleepiness (Epworth sleepiness scale), mental health (depression and anxiety inventories), and fluid intelligence (Raven's progressive matrices). End-of-year cumulative GPA data were extracted from university records.
Results: Students averaged 6.78 hours of total sleep time, 88.3 minutes of social jet lag, and approached clinically poor levels of global sleep quality (M=5.77) and daytime sleepiness (M=9.05). After adjusting for depression symptoms, trait anxiety, fluid intelligence, age, race/ethnicity, and sex (R2=.09, F=6.79, p<.001), the sleep measures explained significant unique variance in end-of-year GPA (delta R2=.05, p<.001). The strongest individual predictors of lower GPAs were poorer global sleep quality (β=-.154, p=.02) and greater social jetlag (β=-.15, p=.002; sleepiness and chronotype were not significant predictors in adjusted models, ps>.05). Sleep quality and social jetlag remained significant predictors of GPA when additionally controlling for standardized test scores (ACT; ps<.05). Students who completed the year with a perfect GPA (4.0) showed 1.2 points better global sleep quality (p=.006) and 23 min lower social jetlag (p=.04) than the remaining students, after correcting for demographic, mental health, and intelligence factors.
Conclusion: Poor sleep quality and social jetlag early in college are independent risk factors for lower future academic success, even when accounting for mental health, fluid intelligence, and demographics. There is a need for individual and environmental interventions to improve sleep health in first year students.
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0148

INTERCONNECTED DYNAMICS OF SLEEP DURATION, SOCIAL MEDIA ENGAGEMENT, AND NEURAL REWARD RESPONSES IN ADOLESCENTS

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Introduction: In today's digital landscape, social media features prominently in adolescents' social interactions and information consumption, influencing their development, potentially altering brain processes. Research shows a bidirectional relationship between social media use and both sleep health and brain activities, especially in executive control and reward processing. These neural developments are pivotal in adolescent behavioral and psychological growth, with sleep being crucial yet underexplored in the context of reward, social (media) behaviors.
Methods: This study investigated the reciprocal links between social media use, self-reported sleep duration, and brain activation in 6,516 adolescents (ages 10-14 years, 46.2% female) from the Adolescent Brain Cognitive Development (ABCD) Study®. Sleep duration was assessed from the Munich Chronotype questionnaire, and recreational social media use through the Youth

Screen Time Survey. Brain activities were analyzed from fMRI scans during the Monetary Incentive Delay (MID) task, targeting regions associated with reward processing. The study used three different sets of models, switching predictors and outcomes each time, to examine the reciprocal relationships between sleep duration, brain activation, and social media use, and their interactions. Age, COVID-19 pandemic timing (before/during), and socio-demographic characteristics were included in the models.
Results: Shorter sleep duration correlated with greater social media usage (p<.001). Notably, interactions between sleep duration and brain activation in the cingulate gyrus (p=.021), inferior frontal gyrus (p=.009), and precuneus (p=.008) predicted social media use. In predicting brain activity, interactions between sleep duration and social media use emerged as significant for the inferior (p=.008) and middle frontal gyrus(p=.003). For sleep duration predictions, interactions were important between social media use and brain activation spanning seven areas, including the cingulate gyrus (p=.039), hippocampus (p=.005), insula (p=.015), inferior frontal gyrus (p=.001), middle frontal gyrus (p=.003), precuneus (p=.038) and the superior frontal gyrus (p=.028).
Conclusion: These results highlight distinct relationships between sleep, social media, and activity across frontolimbic brain regions, key for executive control and reward processing. Such insights deepen our understanding of how individual's unique neural sensitivities to digital technology use and sleep necessity interact in adolescents. Future longitudinal studies based on these findings could pave the way for developing more nuanced, individualized interventions.
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0149

PERCEPTION OF PRIOR SLEEP-WAKE STATE UPON ABRUPT EXOGENOUS AWAKENINGS

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Introduction: The period immediately following an awakening is characterized by sleepiness, poor cognitive performance, and disorientation known as sleep inertia. In an exploratory analysis, we investigated the accuracy of perceived sleep-wake state after being abruptly awoken.
Methods: Thirty-six participants (18 female; 26.6 years ± 6.1) slept in their own homes and were called on a pre-set cell phone three times: twice during their habitual sleep period (approximately 45 min and 135 min after habitual bedtime) and once at their habitual waketime the next morning (n = 108 awakenings). Sleep stage prior to waking was measured by polysomnography. Researchers observed participants remotely via an infrared camera. Participants were asked whether they thought they had been 'asleep', 'awake', or 'unsure' immediately prior to receiving the phone call.
Results: Polysomnography determined that participants were asleep prior to the call for 88.0% (n = 99) of the awakenings (Wake: 8.3%, N1: 10.2%, N2: 27.8%, N3: 38.9%, REM: 11.1%, Undefined: 3.7%). Participants were asleep for all instances in which the self-perceived state prior to awakening was 'asleep'. When state was self-perceived as 'awake' or 'unsure', participants were awake 25% of the time and in N3 sleep 19% of the time (sensitivity: 71.6%; specificity: 100%). One-fifth (n = 7) of the cohort were unable to correctly identify being asleep on multiple awakenings.
Conclusion: Participants correctly identified themselves as being asleep with moderately low sensitivity, but high specificity. Interestingly, even participants in deep sleep stages (N3) sometimes perceived themselves to be awake before the call. A portion of participants were consistently poor at identifying being asleep. These misperceptions of sleep-wake state upon awakening may contribute to the disorientation experienced during the sleep inertia period and may be influenced by individual differences. Although the uneven distribution of sleep-wake states in this sample limits us to descriptive statistics, our exploratory analysis suggests that a systematic assessment of perception during the sleep-wake transition and its subsequent effect on alertness, cognitive performance, and decision making is warranted.
Support (if any): Naval Postgraduate School, via the Naval Medical Research Center's Naval Advanced Medical Development Department (MIPR N3239820WXHN007). NASA Airspace Operations and Safety Program, System-Wide Safety.

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0150

PROMISE OF EARLY COMPLETION RECOVERS ATTENTION CONTROL PERFORMANCE AFTER 24+ HOURS OF EXTENDED WAKEFULNESS

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Introduction: Extended wakefulness often covaries with effects of fatigue compounding performance decrements. Much work has sought to identify mitigation strategies. However, strategies that can be reasonably applied to operational tasks are lacking. In the current study, we leveraged recent motivational accounts of fatigue to determine the feasibility of the promise of early completion to recover attention control performance after extended wakefulness.
Methods: All participants completed 12 sessions of the antisaccade task and psychomotor vigilance task (PVT), starting at 0700 and completing at 1000 the next morning. The promise of early completion instruction was given prior to the 12th session; it was stated that the total time a participant would spend completing their last task was contingent on their performance: perform better than previous sessions and the time could be reduced, perform worse and the time could increase. In experiment 1a (N = 30), participants received the incentive instruction prior to completing their last PVT and did not receive it for the last antisaccade task (and vice versa in experiment 1b; N = 24). Four time points were considered: two at known high alertness times (session 1 – 0700 and session 3 – 1800), at 24 hours awake (session 11 – 0700), and the final incentivized session (session 12 – 1000).
Results: For experiment 1a, the incentivized final PVT showed a large decrease in the proportion of lapses relative to session 11 ($p < .001$, $d = -1.32$). Lapses in session 12 did not differ from sessions 1 or 3. For experiment 1b, the incentivized final antisaccade task showed a large increase in the proportion of correct trials ($p < .001$, $d = 1.14$) relative to session 11. Correct trials in session 12 did not differ from sessions 1 or 3.
Conclusion: The promise of early completion appears to be a strong incentive in recovering attention control performance back to baseline levels and was not task specific. Furthermore, these results dovetail with contemporary accounts of fatigue that hypothesize that decrements are due to shifts in motivation. Future work should aim to investigate a wide range of distractor types and apply the incentive to operational tasks.
Support (if any):

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0151

PERSONALIZED CAFFEINE RECOMMENDATIONS TO ACHIEVE OPTIMAL ALERTNESS LEVELS

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Introduction: Sleep loss impairs alertness, leading to increased injury risk and reduced productivity. Caffeine can safely and effectively mitigate the effects of sleep loss on alertness. However, to be effective, caffeine should be consumed at the right time and amount, depending on sleep history, work schedule and, importantly, sensitivity to sleep loss. Here, we present the 2B-Alert app, a unique smartphone application with capabilities to learn an individual's trait-like response to sleep loss and to provide personalized caffeine recommendations to optimize alertness.
Methods: We conducted a prospective 62-h total sleep deprivation study to validate the capabilities of 2B-Alert. Throughout the challenge, 21 participants used the app to measure their alertness via the psychomotor vigilance test (PVT). The app used the PVT data collected during the first 36 h of wakefulness to learn each participant's sleep-loss response and provided personalized caffeine recommendations (from 0 to 800 mg) at that time, so that each participant would sustain alertness at a pre-specified target level (PVT mean response time of 270 ms) during a 6-h period starting at 44 h into the challenge. To assess the effectiveness of the personalized recommendations, we counted the number of PVT data points during the 6-h period that fell within the target alertness level +/-2 times the within-subject variability of alertness impairment (i.e., +/-60 ms).
Results: Participants' response to sleep loss varied widely from being highly resilient to being highly vulnerable. Accordingly, 2B-Alert recommended no caffeine to five participants, 100-400 mg to 11 participants, and 500-800 mg to five participants. Regardless of their sleep-loss response and the caffeine amount consumed, participants sustained the target alertness level ~80% of the time during the 6-h period.
Conclusion: 2B-Alert automatically learns an individual's trait-like response to sleep loss and provides personalized caffeine recommendations in real time so that individuals achieve a desired alertness level regardless of their susceptibility to sleep loss.
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0152

CABIN CREW ALERTNESS AND PERFORMANCE DURING LONG-HAUL FLIGHTS

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Introduction: Sleep loss and circadian disruption pose a significant risk in aviation. Previous literature has shown that inflight rest facilities influence alertness and performance among pilots, but few studies have evaluated cabin crew. The aim of this research was to assess alertness and performance among cabin crewmembers sleeping in different rest locations during a long-haul out-and-back trip.
Methods: Twenty-nine (5 male) cabin crewmembers (Mage = 30.61, SD = 2.91) flew the same long-haul route (outbound and inbound) with an average flight duration of 10:41 (± 0:14) hours. Participants were randomly assigned to fly on an aircraft with a bunk in both directions or to fly an aircraft with a bunk in one direction and with a high comfort jump seat (HCJS) in the other direction. Throughout the study, they wore an Actiwatch and completed a sleep diary at bedtime and upon waking. They completed a Karolinska Sleepiness Scale (KSS) and a 5-minute Psychomotor Vigilance Task (PVT) at the beginning and at the end of each flight. Seventy-seven percent of flights had a bunk and 23% had a HCJS. A series of mixed-effects models were performed to assess the changes in KSS and PVT when crewmembers slept in the bunk during both directions of flight (bunk-only) compared to when sleep was obtained in the HCJS during one direction and bunk in the other (bunk + HCJS).
Results: Fifty-seven flights were included in the analyses. Cabin crewmembers who slept in bunk-only reported higher alertness at the end of the flight (b = 0.54, SE = 0.17, p = .002, Hedges' g = -0.52) and had faster PVT response speed (b = 0.69, SE = 0.12, p < .001, Hedges' g = 0.18) compared to bunk + HCJS. There were no significant differences in PVT lapses (p = 0.52).
Conclusion: Our results showed that cabin crewmembers reported greater alertness and performed better when they used the bunk-only. Further research is needed to understand how other factors such as duty start time and workload might influence the sleep of cabin crewmembers during long-haul flights.
Support (if any): NASA Airspace Operations and Safety Program, System-Wide Safety Project.

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0153

LOOK BEFORE LEAPING: RELATIONSHIP BETWEEN CIRCADIAN PREFERENCE, SLEEP QUALITY, FATIGUE, AND INJURY RISK IN SOLDIERS

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Introduction: In a previous study, we found that morning circadian preference and increased fatigue were associated with increased injuries during a nocturnal parachute jump. The purpose of the present study was to replicate this finding, and expand upon it by determining whether, and the extent to which, subjective sleep ratings are also predictive of injury during parachute jumps.
Methods: Participants included 27 male active duty Soldiers aged 23.7 ± 2.9 years (M ± SD). Participants completed a series of questionnaires at baseline (1 week prior to jump), pre-jump (1 hour before), and post-jump (1 hour after). Questionnaires about sleep; insomnia symptoms; circadian preference (morning vs. evening); injuries; and subjective experiences of sleepiness, fatigue, and jump quality were administered.
Results: Circadian preference was correlated with 'sleep quality over the previous month' (r = -.537, p < .01) and week (r = -.502, p < .01) with those indicating evening preference reporting

poorer sleep quality. There was no correlation between circadian preference and average total sleep time. No participants had Insomnia Severity Index (ISI) scores above the clinical threshold for insomnia. However, those indicating an evening circadian preference had higher ISI scores ($r = .635$, $p < 0.001$). No significant correlations between circadian preference and previous jump injuries, subjective ratings of parachute landing fall (PLF) quality, or landing hardness were found. Likewise, momentary sleepiness and subjective fatigue were not significantly correlated with PLF or landing hardness.
Conclusion: In this sample of young Soldiers, evening circadian preference was associated with poorer subjective sleep quality and more insomnia-related symptoms. However, neither circadian preference nor fatigue level was significantly correlated with number of previous jump injuries or subjective ratings of jump performance. Given the small sample size and the generally high skill level of the population of parachutists, it is possible that the present n was not sufficient to detect an effect of circadian preference on injuries or jump quality. In future studies, objective measures of sleep should be added, the n should be increased, and the subject sample should include parachutists with a broader range of experience and training.
Support (if any): Department of Defense Military Operational Medicine Research Program (MOMRP)

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0154

EFFECTS OF FATIGUE ON OPERATIONAL PERFORMANCE IN NAVY EXPEDITIONARY ROBOTICS OPERATORS: A DESCRIPTIVE STUDY

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Introduction: Expeditionary robotics operators have a unique mission set within the Navy. These operators utilize small vessels and various robotics systems to achieve missions in austere settings. Those missions often require that operators perform their job under varying environmental conditions that have the potential to induce high levels of fatigue.
Methods: Four platoons (1, n = 10; 2, n = 9; 3, n = 9; 4, n = 11) that were enrolled in a training unit underwent a 5-day field exercise designed to simulate the operational settings of being deployed. Participants were issued a Fatigue Science ReadiBand to collect actigraphy that calculated metrics such as sleep quantity, quality, efficiency, and an alertness score. Operational data (errors) were provided to the research team via the training unit instructor staff. Participants completed the Need for Cognition Scale pre-exercise and the Intrinsic Motivation Inventory (IMI) post-exercise.
Results: Three platoons (1, 3, and 4) completed the entire exercise while platoon 2's exercise was cut short 1 day early due to making too many critical errors. The total number of operational errors were as follows: platoon 1 committed 9 errors; platoon 2, 5 errors; platoon 3, 10 errors; and platoon 4, 2 errors. Platoons 1 and 4 showed a similar downward trend in alertness throughout the exercise, while platoons 2 and 3 had similar but more stable alertness profiles during the exercise. Sleep quality and sleep efficiency were lower in platoons 1 and 4 compared with platoons 2 and 3. Data from the IMI indicated that platoons 1 and 4 demonstrated that they felt more pressure during the exercise than platoons 2 and 3.
Conclusion: Platoon fatigue was not related to operational performance in a straightforward manner. Platoons 1 and 4 were the most operationally competent platoons per instructor feedback, though they experienced lower levels of alertness, worse sleep, and committed more or a similar number of errors relative to the other platoons. It is possible that platoons 1 and 4 were able to compensate in ways that allowed them to overcome heightened fatigue. This highlights the in-depth analyses required when assessing operational fatigue and performance during field operations.
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0155

THE INFLUENCE OF SUBJECTIVE SLEEPINESS ON SOLIDER FATIGUE DURING A 72-HOUR LIVE-FIRE MISSION SIMULATION

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Introduction: The military works under 24/7 operations which can lead to sleep loss and Soldier fatigue. Both sleep loss and fatigue impact functionality and success of the Soldier and ultimately, the entire unit. The functional impact of sleepiness and fatigue can be present differently. Therefore, clarifying the relationship between subjective sleepiness and fatigue is important for military readiness and provides leadership with critical information to ensure mission success.
Methods: Fifty-one healthy, young male participants were recruited from a sample of active-duty Soldiers. The study lasted 5 days with a 72-hour live-fire mission simulation from days 2 to 4. On each of these days, Soldiers completed daily morning surveys, including measures of sleepiness using the Epworth Sleepiness Scale (an 8-question measure to identify clinical sleepiness) as well as subjective fatigue through the Visual Analog Scale.
Results: A repeated measures ANOVA showed a significant main effect for subject sleepiness and fatigue among mission days ($p < 0.05$). Linear regression indicated sleepiness scores were significantly predictive of fatigue each mission day.
Conclusion: On mission day 3 during the 72-hour live fire mission, soldiers were significantly more sleepy and more fatigued compared to other mission days. Additionally, for each mission day, subjective sleepiness was predictive of soldier fatigue. Understanding this relationship and its predictive nature can help military leadership plan accordingly for mission and training events to maximize success in operational contexts.
Support (if any): Department of Defense Military Operational Medicine Research Program (MOMRP); DEVCOM SC

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0156

SUBJECTIVE SLEEPINESS ACROSS THE DAY IN PATIENTS WITH SLEEP DISORDERS

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Introduction: According to the two-process model, sleep propensity rises during waking and it dissipates during sleep. However, the clinical assessment of subjective sleepiness usually overlooks changes of sleepiness across the day. A modified version of the Epworth sleepiness scale has been found to overcome this gap. With this instrument, an overall pattern of increasing sleepiness across the day has been reported. The aim of this study was to evaluate subjective sleepiness across the day in patients with sleep disorders.
Methods: Participants were recruited from the National Institute of Psychiatry. All patients who attended the sleep unit for the first time between December 2021 and November 2023 and filled the Time of Day Sleepiness Scale (ToDSS) were included. The ToDSS consists of 8 items of the Epworth sleepiness scale (ESS) but modified for gathering subjective perception of sleepiness in the morning, afternoon and evening. A general linear model with repeated measures was conducted to assess changes in sleepiness across the day.
Results: One hundred and ninety-five patients were included (female 68.4%, mean age 45.1 SD 15.3). All participants had at least one sleep disorder and 91.3% had a comorbid psychiatric disorder. Scores on ToDSS were: Morning 8.8 (SD=7.3) afternoon 10.6 (SD=6.9), evening 11.3 (SD=7.0); ESS=10.3 (SD=7.2). MANOVA showed a significant main effect for time (Pillai's Trace 0.12; F=11.3, df 2,155, p<.001). There were no significant effects for interactions time x sleep disorder x and time x sleep disorder x psychiatric morbidity. In contrast, a significant effect was found for time x psychiatric morbidity (Pillai's Trace 0.17; F=2.0, df 14, 312, p<.02). In participants with comorbid psychiatric disorders there was a significant increase in ToDSS from morning to afternoon (df 7, F=2.5, p=.01,) but not from afternoon to evening (df 7, F=2.0, p>.05)
Conclusion: Discussion These results are in line with previous research which has described a pattern of increasing subjective sleepiness across the day. But they also suggest this pattern might be different in patients with psychiatric morbidity. Additional research to characterize the clinical implications of these findings is needed.
Support (if any):

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0157

SLEEP, PARTICIPANT-REPORTED OUTCOMES, AND THE GUT MICROBIOME IN COLORECTAL CANCER PATIENTS AND THEIR CAREGIVERS

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Introduction: Colorectal cancer is one of the most common cancers worldwide. Patients with this disease may experience gut dysbiosis and various psychoneurological symptoms (PNS) including, sleep disturbance, psychological distress, and pain. Family caregivers involved in managing their day-to-day needs may also experience similar PNS. This study aimed to explore associations between sleep characteristics and the gut microbiome in patient-caregiver dyads stratified by the presence or absence of PNS.
Methods: Patients with colorectal cancer and their sleep-partner caregivers (20 dyads, 55.49 years old, 60% female patients) self-reported PNS using the Patient Reported Outcomes Measurement Information System (PROMIS) once, from which participants were categorized, using K-means clustering, into normal and symptomatic PNS subgroups. Participants also completed the Sleep Consensus Diary daily for 14 consecutive days, from which sleep characteristics (sleep duration, time in bed, sleep onset latency, wake after sleep onset, and sleep efficiency) were derived. Participants provided stool samples, from which gut microbiome features were investigated using shotgun metagenomic sequencing. MetaPhAn3 for taxonomy classification and MicrobiomeAnalyst2.0 for alpha and beta diversity assessment were employed. PNS subgroup differences in differential taxa abundance, alpha and beta diversity, and gut microbiome feature associations with sleep characteristics were tested separately for patients and caregivers.
Results: 55% of patients and 35% of caregivers were categorized into the symptomatic subgroup. Although no significant differences were observed in alpha and beta diversity between PNS subgroups, nine taxa were uniquely abundant in patients and five in caregivers (unadjusted p<.05) that differed between the PNS subgroups. Regarding sleep characteristics, among patients, greater sleep efficiency (p=.015), shorter time in bed (p=.043), and longer wake after sleep onset (p=.024) were associated with greater alpha diversity (assessed by the Simpson's Diversity Index). However, no significant associations of sleep with alpha and beta diversity were found in caregivers.
Conclusion: Findings suggest sleep disturbance may be a psychoneurological contributor to gut dysbiosis in patients with colorectal cancer. Future investigations to elucidate bidirectional associations between sleep and gut health, one's psychobehavioral impact on the partner's gut microbiome, and other psychoneurological markers that are attributable to caregivers' gut dysbiosis, with a larger sample and prospective longitudinal design, are warranted.
Support (if any):

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0158

NIGHTTIME SNACKING AND SLEEP: COMPARING COMMERCIALLY-AVAILABLE SNACKS CONSUMED BEFORE BED

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Introduction: Most Americans snack at night, though caloric consumption and consumption of certain nutrients and ingredients at night can contribute to sleep disruption and cardiometabolic disease risk. Chips, cookies, ice cream and candy are the most popular snacks consumed before bed. Perhaps certain snacks at night can minimize risks to sleep and cardiometabolic health due to nutritional profile, ingredient composition, and other factors.
Methods: Seventy-seven adults completed a 5-week open-label crossover study. They consumed the same snack each night for 3 days, then had a 4-day washout before switching to the next product. Product order was randomized and included NightFood ice cream (NF; product of interest), Halo Top ice cream (HT; "healthy" comparator), Ben & Jerry's ice cream (B&J; "indulgent" comparator), Lay's potato chips (LAYS; non-ice cream comparator), and no snack. Participants completed daily ratings (3-day mean) for daytime energy, evening cravings, nighttime relaxation, feelings of satisfaction, bloating/discomfort, difficulties initiating and maintaining sleep, feeling refreshed, and sleep continuity (sleep latency, wake after sleep onset, awakenings). Linear mixed models were adjusted for order.

Results: B&J was associated with lower daytime energy vs no snack. B&J and NF were associated with more relaxation at night vs LAYS. All three ice-creams were more satisfying vs LAYS post-snack, but NF and B&J were much more satisfying than HT, and not different from each other. HT and NF were rated lower on bloating/discomfort than LAYS, while B&J was rated much higher. Individuals went to bed earlier if they ate LAYS (~40 minutes), or NF (~25 minutes) vs no snack. Compared to no snack, individuals who ate NF were less likely to report difficulty initiating sleep or returning to sleep, greater sleep quality, and greater feelings of rest and energy the next morning. Conversely, individuals who ate B&J had worse sleep quality and energy the next morning.
Conclusion: Snacks formulated to satisfy cravings while minimizing sleep disruption and including ingredients that may support sleep may be a preferable option for individuals who choose to snack at night. Future work is needed to better understand how to minimize risks and potential adverse impacts of nighttime snacking.
Support (if any): NightFood

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0159

AGE AS A MODERATOR FOR THE RELATIONSHIP BETWEEN EXERCISE BEFORE BED AND DAYTIME SLEEPINESS

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Introduction: It is axiomatic that sleep and exercise are important for good health. However, in the Sleep Hygiene Index (SHI), we suggest exercise within one hour of bedtime is a sleep-related behavior to avoid. More recently, in a systematic review no support was found for evening exercise negatively affecting sleep. Here, we examine age as a moderator for the relationship between sleep and sleep outcomes to reconcile these findings.
Methods: Data were gathered from 10 previous studies from our laboratory administering the SHI and at least one sleepiness measure (Epworth Sleepiness Scale (ESS) and/or the Pittsburgh Sleep Quality Index (PSQI). Participants included primarily college students but also non-college student populations (faculty/staff, alumni, parents, and local community members). This sample included 1668 18-23 year-olds, 219 24-39 year-olds, and 199 40-85 year-olds. Participation was incentivized with bonus points or opportunities to win gift cards. Focus here was on the SHI exercise question ("I exercise to the point of sweating within 1 h of going to bed") answered on a 5-point scale (1=never to 5=always).
Results: Intense exercise within one hour of bed was not common (18-23 year-olds, M=1.58; 24-39 year-olds, M=1.48; 40-85 year-olds, M=1.36). The correlation between exercise and sleepiness measures was quite small (ESS, r(1570)=0.094; PSQI-Global, r(1526)=0.027, and PSQI-Daytime Dysfunction, r(1557)=-0.045). However, the relationship between exercise and sleepiness was significantly moderated by age (b=.935, t(1462)=3.55, p<.001). Although there was no significant relationship for the youngest participants between exercise and sleepiness, a significant small (β=0.09) positive relationship for the middle age group (b=.412, z=3.66, p<.001) and a small to medium (β=0.19) positive relationship for the oldest participants (b=.819, z=5.02, p<.001) existed.
Conclusion: These findings suggest age moderates the relationship between exercise close to bed and sleep outcomes. Although resiliency may protect the young, middle aged and older adults are likely to be vulnerable to pre-sleep exercise. We found although exercise close to bed did not predict sleepiness in younger participants, for older participants the negative effect of exercise close to bed was apparent and increased with age. Clinically, age may be an important variable to consider when advising against exercise before bed.
Support (if any):

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0160

RESISTANCE EXERCISE IN THE LUTEAL PHASE PROMOTES HEAT LOSS AND INCREASES DELTA POWER DURING NOCTURNAL SLEEP

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Introduction: Fluctuation in body temperature rhythm are associated with the menstrual cycle and closely relate to sleep. In particular, during the luteal (high temperature) phase (LP), sleep quality during nocturnal sleep decreases and daytime sleepiness increases. Menstrual cycle-related sleep disturbance can negatively impact a woman's social life. In this study, we investigated the effect of exercise on body temperature, heat loss, nighttime sleep, delta power, and subjective evaluation during the follicular phase (FP) and LP in young-adult women.
Methods: Twelve young-adult females participated in the experiment for a total of 4 days over the course of their menstrual cycle: 1) FP non-exercise condition, 2) FP exercise condition, 3) LP non-exercise condition, and 4) LP-exercise condition. Exercise consisted of 40 minutes of resistance exercise training (RT) at 70% one repetition maximum during the day. Electroencephalography (EEG), electro-oculography, chin surface electromyography, skin temperature, and tympanic temperature were measured simultaneously at the subject's home overnight, and distal-proximal-skin-temperature-gradient was calculated. Sleep EEG data were scored for 30 s epoch periods according to the American Academy of Sleep Medicine Scoring Manual by a registered polysomnographic technologist. Power spectral analysis using the fast Fourier transform (FFT)algorithm was conducted. The study was approved by the Ethics Committee of Saitama Prefectural University.
Results: RT promoted heat loss and increased stage N3 sleep during nocturnal sleep in both the FP and LP. When the distribution of stage N3 duration and delta-power in the sleep period was analyzed, stage N3 sleep and delta power persistence occurred in the second half of the nocturnal sleep period, especially in the LP-exercise condition. The heat loss was also higher and coincided with the increase of delta power in the LP-exercise condition.
Conclusion: RT promoted heat loss, slow wave sleep, and delta power also in the latter half of the nocturnal sleep in the LP, when body temperature is higher and heat loss are disrupted.

Encouraging RT during the LP may help women to overcome sleep disturbance associated with this phase of the menstrual cycle.

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0161

PRELIMINARY FINDINGS ON THE MODERATING EFFECTS OF EXERCISE ON TOBACCO USE AND SLEEP

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Introduction: It is widely understood that the use of tobacco has negative effects on several health outcomes such as sleep disturbances. With all the readily available information concerning these negative factors, there is still a significant use of tobacco amount Black and African American individuals in the United States. This study aims to find any correlation between sleep, exercise, and tobacco use amongst this population.

Methods: A comprehensive statistical analysis was performed using the combined data of both MOSAIC (n=267) and ESSENTIAL's (n=476) data. These are NIH funded studies that are currently active and being conducted. These studies comprised only of Black or African American (n=221 Male; n=424 Female) individuals living in South Florida or New York. Among the 743 participants, 207 reported having smoked at least 100 cigarettes in their life vs non- smokers (n=404). Participants in both the MOSAIC and ESSENTIAL study followed similar procedures. A self-reported baseline survey in Phase 1 consisting of several assessments such as: The Holmes-Rahe Stress score(SS), Everyday Discrimination Scale (EDS), Sleep Disturbances (SD), Insomnia Severity Index (ISI), and Assessment of Sleep Environment (ASE) were used for these findings. Phase 2 consisted of wearing several sleep devices for a 7-day period. Of these devices we utilized the objective data found in the Fitbit activity counter for steps taken.

Results: Of the 743 participants significant t-test values were observed across previously mentioned parameters. With significant findings across the mean scores of the following variables; SS (t=-8.408 , df= 741, p<.001), EDS(t=-18.642, df=741, p<.001), SD(t=-5.644, df=741, p<.001), ISI (t=-11.899, df=741, p<.001), ASE (t=-42.931, df=741, p<.001), and Fitbit Steps (t=-.922,df=232, p=.040). No significant or strong associations were found in a regression linear analysis between steps, ISI, and tobacco use.

Conclusion: Differences in mean scores were found to be significant amongst these variables. Although these results were significant, future research is necessary to find if exercise may have a moderating effect on tobacco use and sleep.

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0162

PRELIMINARY FINDINGS ON THE MODERATING EFFECTS OF EXERCISE ON ALCOHOL AND SLEEP

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Introduction: We sought to gauge how sleep was being affected by alcohol and how other factors that affect may contribute to sleep impairments may be moderated by exercise.

Methods: The overall sample comprised of 743 Black or African American participants from the New York City or the South Florida area from NIH funded studies called ESSENTIAL and MOSAIC. This data was collected from January 2020 to November 2023. A wearable device called Fitbit was used to capture steps. The baseline assessment comprised of questions about the frequency of substance use, Insomnia Severity Index, PROMIS Sleep Disturbance 8a, the Sleep Related Impairment 8a, Everyday Discrimination Scale, Assessment of Sleep Environment, and Holmes-Rahe Stress Inventory. To find the homogeneity of variances between groups, a Levene's test was performed between alcohol and a variety of factors that affect sleep.

Results: In the participant pool (n=743), 57% were female(n=424) and 43% were male(n=221). 27% of participants lived in the New York City area and 73% of participants lived in the South Florida area. 603 participants having at least one drink a month for all data captured in the baseline assessment. We carried out Levene's test statistic for stress (t=–8.408, df=741, m=.95, sd=1.076), everyday discrimination (t= –18.642, df=741, m=39.9, sd=12.846), sleep disturbance (t= –5.644, df=741, m=4.51, sd=9.441), insomnia (t= –11.899, df=741, m=10.24, sd=6.973), sleep environment (t= –42.931, df=741, m=39.43, sd=.572). The p-value was <.001 so there was a significant difference in variance between alcohol and each factor. For steps, 222 out of 234 participants reported at least one drink a month. We carried out Levene's test statistic for sleep disturbance (t= 7555.4862, sd= 4150.84545). The p-value was .040 so there was a significant difference in variance between alcohol and steps.

Conclusion: In South Florida and New York, alcohol consumption was associated with variance in sleep disturbance, sleep impairment, and insomnia symptoms. Alcohol consumption was associated with variance as sleep environment, stress, and discrimination.

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0163

LONGITUDINAL ASSESSMENT OF OBJECTIVE SLEEP AND POWER OUTPUT DURING FALL TRAINING IN DIVISION I COLLEGIATE ATHLETES

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Introduction: Cross-sectional analyses have linked poor sleep to impaired athletic performance. While acute sleep restriction impairs athletic performance, longitudinal investigation of intraindividual sleep and performance variations over time have been sparsely assessed. The purpose of the present study was to determine the relationship between objective habitual sleep and peak power output variations over fall training in Division I collegiate baseball players. We hypothesized that greater total sleep time (TST) and better sleep efficiency (SE) among athletes would be associated with greater improvements in peak power output throughout fall training.

Methods: Twenty-three healthy college baseball players (age: 21±1 years) participated during fall training. Peak power output was assessed weekly for twelve weeks. During the final six weeks of the fall season, all participants were asked to wear Oura rings to objectively determine daily TST and SE within each athlete. The slope of change in peak power output (Pslope) across fall training was compared to objective sleep outcomes. To assess the impact of intraindividual consistency in achieving adequate sleep, Pslope was also compared to the proportion of nights in which TST met or exceeded 7 hours, and the proportion of nights which sleep efficiency met or exceeded 90% within each participant.
Results: Over the 6-wk sleep assessment, participants had a TST of 7.3±1 hours per night and a SE of 89±2%. TST (r=0.398, p=0.067) and SE (r=0.356, p=0.096), demonstrated medium-sized associations with Pslope. The proportion of nights during which TST met or exceeded 7 hours showed a pronounced association with Pslope (r=0.525, p=0.010). Similarly, the proportion of nights during which SE met or exceeded 90% was significantly associated with Pslope (r=0.471, p=0.023). Lastly, the number of nocturnal awakenings was inversely correlated with Pslope (r=-0.468, p=0.024).
Conclusion: Sleep quantity, quality, and consistency during the collegiate baseball fall training showed medium to large associations with improvements in peak power. Further research is needed to establish a causative, mechanistic relationship between sleep and associations with training performance outcomes.
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0164

THE EFFECT OF DELAYING CLASS TIMES ON COGNITIVE PERFORMANCE IN COLLEGE

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Introduction: High school start times have been studied in detail over the past two decades. Findings include better standardized test scores, absenteeism, GPA and fewer sick days with a delayed start time. Few studies to date have examined college course start times, however. The impacts of early college courses on GPA are mixed with one article reporting a better GPA while another reporting the opposite. Many other factors can influence overall GPA such as absenteeism, illness and drug and alcohol use. Because of this, I wanted to determine if there was an impact of early class times on exam scores. I hypothesized that exam scores would be lower on the 7:30 am exam when compared to the 7:30 pm exam.
Methods: Cumulative freshman level anatomy and physiology final exam scores were analyzed from two different sections during the fall 2017 semester at the University of Alaska Anchorage. Both exams had the same 100 questions, students were given 165 minutes to complete the exam and the same instructor taught both sections. The two exams were administered in different lecture halls. There were 67 students in the 7:30 pm section and 153 students in the 7:30 am section.
Results: Independent t-tests revealed that there was significantly ($p < 0.05$) better performance on the 7:30 pm exam (72.9 ± 15.3; mean ± STD) compared to the 7:30 am exam (64.1 ± 17; mean ± STD). Additionally, 19.4% received a failing grade in the 7:30 pm section compared to 46.4% in the 7:30 am section.
Conclusion: Sleep restriction, sleep inertia and an adverse circadian phase most likely contributed to worse performance on the morning exam, which should be further studied. These results suggest that college start times can have drastic and detrimental impacts on student success. College is expensive and time consuming. Administrators and faculty should be cognizant of class start times to optimize student success. These data suggest early morning classes may be detrimental to student performance and college class start times should be studied in further detail.
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0165

ASSOCIATION OF CIRCADIAN MISALIGNMENT WITH DIET AND PHYSICAL ACTIVITY IN ADOLESCENTS

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Introduction: Circadian rhythms, particularly the sleep-wake cycle, food intake (FI) and physical activity (PA) are reciprocally synchronized. Lipid and carbohydrate metabolism pace depend on circadian stability. Timing, quality and quantity of FI and PA align circadian clocks. Therefore, circadian misalignment, which is highly prevalent in adolescents, is potentially impacting this triad. We examined whether subjective and objective metrics of circadian misalignment are associated with FI and PA in adolescents.
Methods: We assessed 377 adolescents from the Penn State Child Cohort (median 16 years; 46% female; 22% racial/ethnic minority) who had a minimum of 3-nights of at-home actigraphy (ACT) and a 9-h in-lab polysomnography (PSG). ACT-measured sleep midpoint (SM) was calculated as the central point of the sleep period, while sleep regularity (SR) was calculated as the intra-individual standard deviation of the SM. Circadian preference (CP) was measured with the Morningness-Eveningness Questionnaire. Bouts of sedentary behavior (SB) and level of SB and of moderate-to-vigorous PA (MVPA) were also derived from ACT. FI was measured via the Youth/Adolescent Food Frequency Questionnaire. PA and FI were dependent variables. Stepwise linear regression models adjusted for demographics (sex, race/ethnicity, age, BMI percentile), sleep disorders (insomnia, PSG-apnea/hypopnea index) and insufficient sleep (ACT-mean sleep duration, ACT-sleep duration variability).
Results: A later SM was significantly associated with greater intake of carbohydrates (β=.125, p=.022), an association that was attenuated when adjusting for sleep variability (β=.094, p=.102). A later SM was also associated with greater bouts of SB, even when adjusting for all covariables (β=.167, p=.006). Neither SR nor CP were significantly associated with FI or PA in adolescents.
Conclusion: Adolescents with a delayed sleep phase are more likely to consume more carbohydrates and have greater number of periods of sedentary behavior. Circadian misalignment of the sleep-wake cycle, and its associated variability in sleep duration, should be an integral part of interventions targeting poor dietary choices and sedentarism in youth.
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0166

POPULATION-BASED ESTIMATES OF DROWSY DRIVING AMONG US TEENS: A NATIONAL SLEEP FOUNDATION STUDY

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Introduction: Drowsy driving represents a large public health concern, accounting for a significant proportion of motor vehicle crashes. Among US teenagers, motor vehicle crashes are the second leading cause of death. However, a dearth of research has documented the prevalence and frequency of drowsy driving in teens, as well as beliefs surrounding drowsy driving. The overarching goal of the present study was to document the prevalence, frequency, and perceptions of drowsy driving among teens.
Methods: We conducted a nationally-representative, probability-based survey of 1,124 US individuals aged 13 to 17 years to assess drowsy driving prevalence, frequency, and beliefs. Results have an estimated margin of error of ~4%. Survey respondents reported whether they have ever driven while so tired they had a hard time keeping their eyes open, how often they did so, what kept them from getting the sleep needed to drive alert, and perceived risks associated with drowsy driving. Measures of central tendency and dispersion were used to characterize responses.
Results: Approximately one in six teen drivers reported having driven drowsy. Projected to all US teen drivers, over 400,000 drive drowsy at least once per week. Teen drivers who work for pay were more than twice as likely to have reported drowsy driving than teens who didn't work for pay. When asked about what prevented them from getting the sleep they needed to drive alert, the majority of teens pointed to work or school schedules. When asked about the risks associated with drowsy driving, 95% of teens said drowsy driving is extremely or very risky. However, when asked about the likelihood of drunk, drugged, distracted, and drowsy driving leading to death or serious injury, drowsy driving was seen as having the lowest risk of death or serious harm.
Conclusion: Due to a confluence of factors, including driving as a newly learned behavior and multiple competing time demands, teenagers find themselves at increased risks for drowsy driving and drowsy driving-related consequences. We found that approximately 1.7 million teenage drivers had driven while so tired they had a hard time keeping their eyes open. Increased attention to this preventable public health concern is needed.
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0167

BENEFITS OF DAYTIME NAPPING

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Introduction: The topic of workplace siestas has sparked a conversation with valuable findings emerging about job performance and employee well being. In this IRB approved investigation and statistical analysis, our goal was to assess the benefits of taking a midday nap on cognitive efficiency.
Methods: -Accrual study group target was 39 internal medicine residents (PGY1, PGY2, PGY3). Enrolled and consented residents totaled 15. PGY1 residents were picked at random from in-patient rotation. If no PGY1 residents were available, then PGY2 and PGY3 residents were selected. -Control study group included eligible residents not napping but took the vigilance test before and after the noon conference. -Exclusions criteria- age >55 years, sleep disorders, and currently on stimulators or sedatives. -Naps took place between 12 to 1 PM from October 16th to December 15th. -Each resident took a pre-nap sleep vigilance test, napped for 25 minutes, walked for 7 minutes, took a post-nap sleep vigilance test, and filled out a survey.
Results: Key findings: -A total of 37 napping encounters from 11 participants. -A total of 16 non-napping encounters from 11 participants. -Post-nap, 81% of the residents improved (average improvement- 7.4%) and 19% worsened (average decline in performance- 5.7%). -Post-nap, self reported outcomes: less than 5 residents felt more tired, one experienced a headache, and one reported irritability. -Self reported assessment: 49% napped and 51% were unable to nap. -Control group: 93% showed worsened vigilance scores (average- 15%); 7% improved (average 16%). Limitations: -Limited to mostly PGY1 residents during in-patient within 2 months. -Study relied on residents volunteering. -A large portion of the residents did not participate in the study at times. -Unable to perform an actual sleep study (polysomnography) and get more accurate measurements. Future direction: -There needs to be a more in-depth study, involving several different residency programs and more accurate and reliable results. -Use motivational techniques to get more volunteers. -Allowing residents to nap periodically.
Conclusion: -Overall, most residents who took a 25-minute nap improved on the vigilance test. -Better efficiency can translate into better patient care and less mistakes. -Residents would benefit from a daytime nap.
Support (if any):

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0168

EFFECT OF ENVIRONMENTAL NOISE ON SLEEP ARCHITECTURE AMONG BLACK ADULTS

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Introduction: Sound is among the plethora of external stimuli impacting sleep. Previous research shows that noises above 45 dB disrupts normal human sleep architecture. High noise results in an increased duration of light sleep stages (NREM 1 and NREM 2) and a decrease in deeper stages (NREM 3 and REM). However, these findings are from studies that assessed the acute impact of noise on sleep. Additionally, the populations used in these studies were not racially diverse. Researching sleep in these populations is vital as sleep health disparities are prevalent in minoritized racial/ethnic groups in the United States. The objective of this study is to identify how long-term exposure to environmental noise at the neighborhood level alters sleep structure in Black adults.
Methods: Black adults (N = 101, 71.3% female, aged 37.9±13.2 years) were observed for a total of 573 night's sleep. Sleep parameters were gathered using the SleepImage® ring. This device divides sleep into three categories based on cardiopulmonary coupling: unstable sleep, stable sleep, and REM sleep. Unstable

sleep is defined as including all of NREM 1 and parts of NREM 2, while stable sleep encompasses the rest of NREM 2 and all of NREM 3. Environmental noise was determined via HowLoud, a website which assigns a sound score to an address based on a combination of vehicle traffic, air transport, and other local factors. A linear regression was performed to examine how sound score impacts on sleep structure.
Results: Results of the regression analysis showed that sound score was significantly associated with percent unstable sleep in Black adults ($F(1,99) = 4.67$, $p = 0.0332$). This indicates that sound score is associated with a decreased percent unstable sleep ($\beta 1 = -0.463$).
Conclusion: Greater levels of environmental noise are associated with an increased amount of unstable sleep among Blacks. These results suggest that quieter nights may lead to deeper and more restorative sleep. This is consistent with previous studies, supporting the notion that this biological mechanism is universally relevant. Finally, this study elucidates the detrimental effects of chronic noise pollution and highlights the importance of one's neighborhood on sleep health.
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0169

NIGHTTIME SAFETY OF DARIDOREXANT: RESPONSE TO NOISE STIMULI, AND EFFECTS ON POSTURAL STABILITY, WALKING AND MEMORY

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Introduction: Daridorexant is a dual orexin receptor antagonist approved for the treatment of adult patients with insomnia disorder. Following single-dose administration at bedtime to healthy non-elderly and elderly subjects, pharmacodynamics (PD) and safety were investigated in the middle of the night (MOTN) after forced awakening to a noise stimulus.
Methods: Double-blind, placebo-controlled, randomized, 3-way crossover study (placebo, 25, and 50 mg daridorexant in the evening) in 36 male and female non-elderly and elderly subjects (1:1 sex/age ratio). Four h after bedtime administration, the auditory awakening threshold (AAT) was determined (increasing noise signal up to 100 dB). Next, the main PD endpoint postural stability (body sway) as well as basic functional mobility (Timed Up and Go (TUG) test), and cognitive function/memory using the Visual Verbal Learning Test (VVLT) were assessed. Thereafter, subjects returned to bed.
Results: All 36 subjects completed the study. The average AAT was approximately 60 dB across treatments with no differences between daridorexant and placebo. Body sway showed a small, dose-dependent increase vs placebo with differences in least square means (LSM) 95% confidence interval (CI) of 36.7 (2, 71) and 65.9 (31, 100) mm, for daridorexant 25 and 50 mg, respectively. The overall increased body sway was driven by non-elderly subjects, as effects in elderly were similar to placebo. Subjects completed the TUG test in 6–8 s across treatments, with a small, dose-dependent increase vs placebo with a difference in LSM (95% CI) of 0.14 (0.02, 0.27) and 0.47 (0.34, 0.59) s for daridorexant 25 and 50 mg, respectively. The VVLT (immediate and delayed number of correctly recalled words) showed minimal differences in LSM (95% CI) to placebo of up to –1.0 (–1.5, –0.5) and –0.7 (–1.2, –0.2) words for daridorexant 25 and 50 mg, respectively. During delayed word recognition, subjects correctly recognized 77–79% true positive and true negative words across treatments with no difference to placebo for either daridorexant dose.
Conclusion: Following bedtime administration, daridorexant preserved the ability to respond to external noise stimuli and subjects were able to operate safely during the night.
Support (if any): Idorsia Pharmaceuticals Ltd

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0170

INSOMNIA AND IMPULSIVITY: A SYSTEMATIC REVIEW AND META-ANALYSIS

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Introduction: Growing evidence indicates that sleep disturbances are associated with impaired cognitive control, resulting in an increased risk for impulsive behaviors and risk-taking. However, the findings remained mixed and a synthesis of the evidence focusing on insomnia symptoms while including holistic measurements of impulsivity is lacking. This systematic review and meta-analysis aimed to examine whether insomnia symptoms are associated with impulsivity.
Methods: The review was performed following PRISMA guidelines. Four electronic databases, PubMed, Web of Science, Embase, and PsychINFO were systematically searched from inception to December 2022. Studies were included if they reported the correlation between quantitative measures of insomnia symptoms and impulsivity. Excluded studies were case reports, dissertations, reviews, or conference abstracts. Subgroup analyses were performed to determine whether different populations and measures of impulsivity affected the strength of the association. Data were pooled using the random-effects model and heterogeneity was quantified using I2.
Results: Across the 42 eligible studies, involving 17091 subjects (59% female; mean age 33 years), there was a significant positive association between insomnia symptoms and impulsivity ($r = 0.16$, 95% CI, 0.09- 0.24, $p < 0.01$). Subgroup analyses showed that impulsivity, as measured by self-report, was positively associated with insomnia symptoms ($r = 0.22$, 95% CI, 0.15- 0.29, $p < 0.01$), but this association was not found based on the behavioral measures of impulsivity ($r = -0.11$, 95% CI, -0.30- 0.09, $p = 0.28$). Meta-regression suggested that publication year was a significant moderator, with studies published more recently showing smaller effect sizes.
Conclusion: Our findings demonstrate that insomnia symptoms are associated with higher levels of self-reported impulsivity. This points to a crucial next step in clinical practices to target insomnia as a modifiable factor to reduce impulsivity and risk-taking behaviors. Future studies should evaluate this association using samples with a clinical diagnosis of insomnia, with behavioral measures of impulsivity. Furthermore, neuroimaging techniques could be incorporated to unveil the underlying neural mechanisms between impulsivity and insomnia.
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0171

EEG MARKERS FROM ROUTINE SLEEP DISCRIMINATE INDIVIDUALS WHO ARE VULNERABLE OR RESILIENT TO SLEEP LOSS

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Introduction: Sleep loss is widespread among civilians and military personnel, and is often unavoidable due to family or work obligations. Although sleep loss impairs cognition, individuals differ in the extent of these impairments. Identifying these phenotypical variations between individuals offers the opportunity to assign individuals who are resilient to sleep loss to tasks that require sustained vigilance, and to provide sleep-loss countermeasures to individuals who are more vulnerable. Current methods to identify an individual's phenotypical response to sleep deprivation require time-consuming sleep-loss challenges. Here, we sought a more practical approach to label individuals as resilient or vulnerable to sleep loss by identifying electroencephalographic (EEG) markers obtained from routine night sleep.
Methods: We retrospectively analyzed four studies in which 49 healthy young adults (18 women) completed a laboratory baseline-sleep phase followed by a sleep-loss challenge. After classifying subjects as resilient or vulnerable to sleep loss based on psychomotor vigilance test performance, we extracted three EEG features from four channels during the baseline nights, evaluated the discriminatory power of these features using the first two studies (discovery), and assessed reproducibility of the results using the remaining two studies (reproducibility).
Results: In the discovery analysis, we found that, compared to resilient subjects, vulnerable subjects exhibited 1) higher slow wave activity (SWA) power in channels O1, O2, and C3; 2) higher SWA rise rate in channels O1 and O2; and 3) lower sleep spindle frequency in channel C4. Our reproducibility analysis confirmed the discovery results on SWA power and SWA rise rate, and for all three EEG features we observed consistent group-difference trends across all four channels in both analyses.
Conclusion: The higher SWA power and SWA rise rate in vulnerable individuals suggest that they have a higher accumulated sleep pressure under normal rested conditions, and allowed us to identify individuals who are resilient or vulnerable to sleep loss.
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0172

PREDICTIVE RELATIONSHIPS BETWEEN BASELINE AND RECOVERY SLEEP AND NEUROBEHAVIORAL MEASURES DURING SLEEP DEPRIVATION

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Introduction: We investigated whether baseline sleep measures derived from actigraphy the night before total sleep deprivation (TSD) predicted cognitive performance and subjective sleepiness and fatigue during TSD. We also investigated whether these measures during TSD predicted that night's recovery sleep.
Methods: Thirty-two adults (ages 27-53;14 females) participated in a five-day experiment under controlled conditions comprised of two baseline 8h time in bed (TIB) nights (B1, B2), approximately 39h of TSD, and two recovery nights of 8-10h TIB (R1=10h, R2=8h). Neurobehavioral measures including the Digit Symbol Substitution Test (DSST), Digit Span (DS), the 10-minute Psychomotor Vigilance Test (PVT), the Karolinska Sleepiness Scale, and the Profile of Mood States Fatigue scale were collected at 0400h, 1130h, and 1730h during TSD. During the second baseline night (B2) and the first recovery night (R1), wrist actigraphy (Actiwatch Spectrum) assessed sleep indices including sleep duration, sleep onset latency (SOL), wake after sleep onset (WASO), sleep efficiency (SE), percent sleep, and the timing of sleep onset, offset, and midpoint. Pearson's correlations determined relationships between B2 sleep and TSD neurobehavioral measures and between TSD neurobehavioral and R1 sleep measures ($p < 0.05$ was significant).
Results: Greater SE at baseline was significantly associated with less subjective sleepiness during TSD ($r=-0.415$;$r2=0.172$), and a later sleep onset ($r=-0.409$;$r2=0.167$) and a later midpoint ($r=-0.376$; $r2=0.142$) were significantly correlated with less subjective fatigue during TSD. Higher DSST scores during TSD were significantly associated with shorter duration, greater SOL, and a later sleep onset during recovery (r:−0.473-0.547; r2:0.172-0.299). Similarly, higher DS scores significantly correlated with later sleep onset ($r=0.370$; $r2=0.137$). Fewer PVT lapses during TSD were significantly associated with shorter duration, higher SE, lower WASO, higher percent sleep, and an earlier sleep offset during recovery (r:−0.417-0.489; r2:0.136-0.239).
Conclusion: Our novel findings demonstrated that measures of sleep continuity and timing the night before TSD predicted resilience to subjective sleepiness and fatigue, but not cognitive performance during TSD. By contrast, cognitive but not subjective performance resilience during TSD predicted that night's recovery sleep duration, continuity, and timing. Thus, actigraphic measures uniquely predict subjective responses to TSD and reflect cognitive performance responses during sleep loss.
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0173

BASELINE ACTIGRAPHIC SLEEP MEASURES PREDICT CARDIOVASCULAR RESPONSES TO SLEEP DEPRIVATION AND PSYCHOLOGICAL STRESS

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Introduction: We determined whether baseline sleep measures the night before total sleep deprivation (TSD) predicted cardiovascular (CV) responses to TSD and to TSD and psychological stress.
Methods: We conducted a five-day experiment under controlled conditions in thirty-two healthy adults (ages 27-53; 14 females). During this experiment, CV measures were collected via echocardiography or blood pressure monitor at four assessment time points: 1) after two baseline 8h time in bed (TIB) nights (B1,

B2); 2) in the morning of TSD (TSD AM; after 25h of TSD); 3) in the evening of TSD following a modified Trier Social Stress Test, which induced psychological stress (TSD PM; after 34h of TSD); and 4) after two recovery nights of 8-10h TIB. Seated stroke volume (SV), heart rate (HR), cardiac index (CI), left ventricular ejection time (LVET), systemic vascular resistance index (SVRI), mean arterial pressure (MAP), and systolic and diastolic blood pressure (SBP and DBP) were collected. Wrist actigraphy (Actiwatch Spectrum) assessed sleep indices during the second baseline night (B2) including sleep duration, sleep onset latency (SOL), wake after sleep onset (WASO), sleep efficiency (SE), percent sleep, and the timing of sleep onset, offset, and midpoint. Pearson's correlations assessed relationships between B2 sleep metrics and TSD AM and TSD PM CV responses ($p \leq 0.05$ was significant).

Results: Higher WASO during baseline was significantly associated with lower SV ($r=-0.374$; $r2=0.140$) and higher SVRI ($r=0.358$; $r2=0.128$) during the TSD evening. By contrast, there were inverse relationships for percent sleep and SE during baseline, whereby these metrics were significantly associated with higher SV and lower SVRI during the TSD evening (r:−0.398-0.387; r2:0.126-0.159). In addition, a later sleep offset during baseline was significantly associated with higher MAP, SBP, and DBP during the morning and the evening of TSD (r:0.391-0.453; r2:0.153-0.205).

Conclusion: Our novel results found that actigraphic sleep metrics the night before TSD predicted CV responses in healthy adults, particularly during TSD and psychological stress in the evening. Thus, WASO, percent sleep, SE, and sleep offset timing during fully rested conditions are possible predictors and biomarkers for assessing the adverse cardiovascular responses to TSD and psychological stress.

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0174

USING LOW-DOSE ACETYLSALICYLIC ACID TO TARGET INFLAMMATION IN RESPONSE TO EXPERIMENTAL SLEEP RESTRICTION IN HUMANS

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Introduction: Sleep deficiencies, such as manifested in short sleep duration or insomnia symptoms, are known to increase the risk for multiple chronic diseases. Inflammation is considered a mechanism through which deficient sleep acts as risk factor for these diseases. Thus, mitigating inflammation might be a potential way to diminish negative health consequences related to sleep deficiency. To investigate a pharmacological approach for this, we used low-dose acetylsalicylic acid (ASA, aspirin), known for its counter-inflammatory actions including the cyclooxygenase (COX)-, NF-kB-, and resolution-pathways. Our aim was to investigate whether low-dose ASA can blunt the pro-inflammatory response to experimental sleep restriction.

Methods: 46 healthy adults (19F/27M, 19-63 years) participated in a randomized placebo-controlled crossover trial with 3 protocols each consisting of a 14-day at-home phase followed by an 11-day (10-night) in-hospital stay (sleep restriction/ASA, sleep restriction/placebo, control sleep/placebo). In the sleep restriction/ASA condition, participants took low-dose ASA (81 mg/day) during the at-home phase and in-hospital stay. Each in-hospital stay started with 2 nights of 8h-sleep opportunity. Then, under the sleep restriction conditions, participants were exposed to 5 nights of 4h-sleep opportunity, followed by 3 nights of recovery sleep (8h/night). The control sleep condition provided 8h-sleep opportunity throughout the in-hospital stay. Sleep and immunologic/hematologic measures were assessed at baseline, after the 5th night of sleep restriction/control sleep, and after the 2nd night of recovery sleep. Generalized linear mixed models were used for analysis.

Results: Administration of low-dose ASA reduced interleukin (IL)-6 expression ($p<.05$ for condition*day) and COX-1/COX-2 double positive cells in lipopolysaccharide (LPS)-stimulated monocytes ($p<.05$ for condition) as well as C-reactive protein (CRP) serum levels ($p<.01$ for condition) in the sleep restriction condition compared to placebo. Baseline comparisons revealed no differences between conditions ($p>.05$ for condition).

Conclusion: The results show that preemptive administration of low-dose ASA can reduce pro-inflammatory responses to experimental sleep restriction in humans. These findings may open new therapeutic approaches to prevent or control inflammation and its consequences in those experiencing periods of sleep deficiency.

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0175

5-NIGHTS OF SLEEP RESTRICTION AND IMPULSIVITY-RELATED FMRI BRAIN ACTIVITY IN ADOLESCENTS WITH ADHD TRAITS

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Introduction: Sleep loss can adversely affect brain mechanisms underlying attention and inhibitory control, potentially leading to increased impulsive behavior. We propose that youth with more severe attention deficit/hyperactivity disorder (ADHD)-like traits may be particularly vulnerable to sleep loss on impulsivity tasks. We examined this possibility using an fMRI Go/No-Go task in a within-subject at-home sleep restriction experiment in children with high or low ADHD-like traits.

Methods: Thirty adolescents (13M; 12.14±0.99yrs) were grouped by the Conners-3-Parent ADHD-Probability Index [>=/< 50%tile] as high (ADHDy; n=13) or low (ADHDn; n=17). All children completed two counterbalanced conditions: 5-nights of sleep optimization (SO; 10h TIB set to habitual risetime) and 5-nights of sleep restriction (SR; 7.5h TIB; delaying bedtime and advancing risetime equally). At least 2 nights of stabilization preceded both conditions. Following both SO and SR, participants completed fMRI scanning consisting of two 7-minute runs

of an event-related Go/No-Go task. We investigated activation associated with impulsive errors (commissions>hits). Voxel-wise 2x2 linear mixed effects models (3dLME) examined condition [SR vs. SO], group [ADHDy vs. ADHDn], and interaction effects with significance set to p<.005, k=30 voxels.
Results: Wrist actigraphy indicated that SR was successful in reducing sleep period time by 20% (SR= 7.32±0.48 vs. SO= 9.14±0.46h; [t(29)=21.23, p<.001; d=3.88]) and total sleep time by 17% (SR= 6.72±0.55 vs. SO= 8.13±0.65h; [t(29)=15.08, p<.001; d=.2.75]). At SO, commission errors (vs. hits) were associated with higher activation in the bilateral putamen, bilateral precentral gyri, left inferior frontal gyrus, and the bilateral insula. We identified a significant condition-x-group interaction in the right dorsolateral prefrontal cortex (MNIx,y,z: [29, 35,47, k=65), whereby sleep restriction decreased error signaling for the ADHDn group, but not for the ADHDy group.
Conclusion: These initial findings indicate that ADHD traits may moderate the impact of sleep loss on impulsive error signaling during the Go/No-Go task. Those in the ADHDy group appear particularly sensitive to commission error processing in the prefrontal cortex. As data collection continues, our analyses will pivot to computational modeling of inter-individual variability in this effect.
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0176
FMRI NEURAL ACTIVATION DURING WORKING MEMORY AFTER 5-NIGHTS OF SLEEP RESTRICTION IN ADOLESCENTS WITH ADHD TRAITS

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Introduction: Persistent sleep loss is common among adolescents. Its impact on cognitive functioning is well documented, particularly in working memory. We hypothesize that children with attention-deficit/hyperactivity-disorder (ADHD) may be particularly vulnerable to such effects. Here we examine the impact of 5-nights of at-home sleep restriction on the neural correlates of working memory in young adolescents with and without ADHD traits.
Methods: Twenty-five peripubertal adolescents (12.36±0.88 years, 14F) were characterized by Conners-3-Parent ADHD-Index [>=/< 50% tile] as either high (ADHDy; n=11) or low (ADHDn; n=14). All participants completed an fMRI-monitored working memory task after two counterbalanced conditions: 5-nights of sleep optimization (SO; 10h TIB set to habitual risetime) and 5-nights of sleep restriction (SR; 7.5h TIB, equally delaying bedtime and advancing risetime). At least two nights of stabilization preceded both conditions. fMRI sessions consisted of two 7-minute runs of alternating 2-back and 0-back working memory blocks. Voxel-wise 2x2 linear mixed effects models (3dLME) investigated condition [SR vs. SO], group [ADHDy vs. ADHDn], and interaction effects on working memory activation (2-back>0-back). Significance was set to p<.005, k=30 voxels.
Results: Our actigraphy monitored protocol significantly reduced sleep period time by 20% (SR= 7.39±0.43h vs. SO= 9.19±0.39h; [t(24)=17.66, p<.001; d=3.53]) and total sleep time by 17% (SR= 6.79±0.51h vs. SO= 8.20±0.60h; [t(24)=12.9, p<.001; d=2.58]). At SO, fMRI 2-back blocks were associated with increased activation in task-on areas, such as the bilateral dorsal lateral prefrontal, anterior cingulate, and superior parietal cortices, and decreased activation in default-mode task-off areas, including the precuneus and medial prefrontal cortex. Of these regions, significant condition-by-group effects indicated that sleep loss increased activation in the bilateral superior parietal cortex (MNIx,y,z: [40, -48, 68], k=172) and bilateral cuneus/precuneus (MNIx,y,z: [16, -84, 48], k=1446), only in the ADHDy group.
Conclusion: These data are the first to indicate that ADHD status may influence how sleep loss affects working memory in the adolescent brain. Sleep loss increased activation of both task-on (e.g., superior parietal) and task-off (e.g., precuneus) regions in the ADHDy group. We speculate this pattern may reflect less efficient neural processing after sleep loss. Ongoing data collection will probe sources of inter-individual variability.
Support (if any): R01HD103655; P20GM139743

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0177
IMPROVING WATCHSTANDING SCHEDULES ON US NAVY WATCHFLOORS

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Introduction: This project assessed the work/rest schedules of shift workers on information warfare enterprise (IWE) watchfloors. Our objectives were to document and evaluate the watchbills used, assess the watchstanders' state, and develop fatigue mitigation recommendations tailored to the watchfloors.
Methods: Data were collected from two US Navy watchfloors (N=82 participants; 62.2% males, median age of 27 years (range 19 to 54 years, 85.4% enlisted). Using a quasi-experimental, longitudinal approach, participants wore ŌURA rings and completed questionnaires at the beginning and end of the study (Epworth Sleepiness Scale-ESS; Insomnia Severity Index-ISI; Profile of Mood States-POMS). The first watchfloor used a 4-section/12hr-shift watchbill; the other used a 6-section/8hr-shift watchbill. Watchstanders rotated between all shifts in their watchbill every 30 days. The sleep/wake patterns of watchstanders were modeled with the Sleep, Activity, Fatigue, and Task Effectiveness model implemented in the Fatigue Avoidance Scheduling Tool (SAFTE/FAST).
Results: Participants slept a median 6.7hrs/day with 62.3% sleeping < 7hrs/day and 14.5% sleeping < 6hrs/day. Approximately 89% of participants were classified as poor sleepers, 30.5% reported symptoms of excessive daytime sleepiness, 20.7% reported symptoms of insomnia, and 20.7% had all three conditions. Approximately 74% of participants scored worse than the 50th percentile of the normal adult population on total mood disturbance; 79.0% scored worse on tension-anxiety, 80.3% on vigor-activity, 72.8% on fatigue, and 80.3% on confusion-bewilderment subscales (all p< 0.05; POMS). While the watchstanders preferred the 6-section/8hr-shift watchbill compared to the 4-section/12hr-shift watchbill, no differences were observed in any of the variables of interest (daytime alertness, insomnia symptoms, mood, daily sleep duration, napping, long sleep episode variables; all p>0.10).
Conclusion: The 6-section/8hr-shift watchbill with shorter shifts and more duty sections is generally preferable to the

4-section/12hr-shift watchbill. Based on these findings, FAST model predictions, background literature on shiftwork, and other studies conducted by the NPS Crew Endurance Team, we developed fatigue mitigation guidelines and recommendations.
Support (if any): This study was funded by the Naval Postgraduate School, Naval Research Program (NRP Project ID: NPS-23-N055-A).

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0178
CUMULATIVE EFFECTS OF MILD SLEEP RESTRICTION ON LAPSES OF ATTENTION

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Introduction: Sleep deprivation leads to detriments in performance, including alertness and vigilance. Less is known, however, about the cognitive impact of mild sleep restriction, including whether negative outcomes are time-dependent and cumulative. We tested the impact of sleep restriction on sustained attention in a multi-week, crossover experiment in a controlled laboratory setting.
Methods: Sixty-six young adults (Mage = 20.03; 53.0% female; 51.5% non-white) completed seven nights of in-laboratory testing, spread across 3-weeks. On the first week, participants completed a polysomnography adaptation night and baseline assessments including the psychomotor vigilance task (PVT) in the evening (9:00PM) and in the morning (7:30AM) with buffer time to prevent sleep inertia following initial awakening. During the following week, participants completed either three nights of sleep restriction (5 hours of sleep/night) or three nights of normal sleep (8 hours of sleep/night), with PVT testing each morning and evening. After a four-night washout period, participants returned to complete the other sleep condition (order counterbalanced). Research assistants who administered the PVT were kept blinded to the participant's sleep condition.
Results: Relative to normal sleep, three nights of sleep restriction significantly worsened PVT mean reaction times (RTs; M = 361 ms versus M = 390 ms; $t(65) = 4.38$, $p < .001$, $d = .54$) and number of lapses (M= 3.78 versus M = 5.80; $t(65) = 5.00$, $p < .001$, $d = .62$]. There were no main effects of time of day or interactions with sleep condition (ps>.05). However, study day significantly interacted with sleep condition ($F(2, 128) = 3.42$, $p = .036$, $\eta 2 = .051$) such that the negative impact of sleep restriction on lapses worsened across the week (night 1: Mdiff = 1.59, night 2: Mdiff = 0.88; night 3: Mdiff = 3.26).
Conclusion: Mild sleep restriction quickly produces detriments in sustained attention, with effects being cumulative across repeated days of sleep loss.
Support (if any): This study was supported by the National Science Foundation (1920730).

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0179
CARDIOVASCULAR RESPONSES TO SLEEP DEPRIVATION AND PSYCHOLOGICAL STRESS PREDICT ACTIGRAPHIC SLEEP DURING RECOVERY

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Introduction: We assessed whether cardiovascular (CV) responses to total sleep deprivation (TSD) and to TSD and psychological stress predicted sleep measures during that night's recovery.
Methods: Thirty-two healthy adults (ages 27-53; 14 females) participated in a five-day experiment under controlled conditions. During this experiment, CV measures were collected via blood pressure monitor or echocardiography at four assessment time points: 1) after two baseline 8h time in bed (TIB) nights; 2) in the morning of TSD (TSD AM; after 25h of TSD); 3) in the evening of TSD following a modified Trier Social Stress Test, which induced psychological stress (TSD PM; after 34h of TSD); and 4) after two recovery nights (R1=10h TIB; R2=8h TIB). Seated heart rate (HR), cardiac index (CI), stroke volume (SV), systemic vascular resistance index (SVRI), left ventricular ejection time (LVET), systolic and diastolic blood pressure (SBP and DBP), and mean arterial pressure (MAP) were collected. Wrist actigraphy (Actiwatch Spectrum) assessed sleep measures during the first recovery night (R1) including the timing of sleep onset, offset, and midpoint, sleep duration, wake after sleep onset (WASO), sleep efficiency (SE), percent sleep, and sleep onset latency (SOL). Pearson's correlations assessed relationships between TSD AM and TSD PM CV responses and R1 sleep indices ($p< 0.05$ was significant).
Results: Longer LVET in the morning and in the evening of TSD were significantly associated with longer sleep duration and later sleep offset during recovery (r: 0.386-0.471; r2: 0.149-0.222). In addition, longer LVET in the evening of TSD was significantly associated with higher WASO during recovery ($r=0.385$; $r2=0.148$). By contrast, lower HR in the morning ($r=-0.449$; $r2=0.202$) and in the evening ($r=-0.499$; $r2=0.249$) of TSD were significantly related to a later sleep offset during recovery.
Conclusion: To the best of our knowledge, this is the first demonstration that CV responses to TSD and to TSD and psychological stress, are reflected in the duration, quality, and timing of actigraphic sleep during the immediate recovery night in healthy adults. Overall, LVET and HR during sleep deprivation may be unique biomarkers for determining sleep responses during recovery that night.
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0180
CREW SLEEP DURING A 36-DAY ARCTIC TRANSIT: PRELIMINARY RESULTS

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Introduction: Extreme environmental conditions (e.g., natural light conditions, time zone transitions), and specific operational conditions (e.g., ship motion due to ice breaking) combined with a variety of other occupational stressors (including shift work, psychological stress, and performing physically strenuous activities), poses unique challenges when conducting polar operations. The overarching aim of this project is to assess the unique challenges sailors experience when operating in polar regions in order to identify performance-limiting factors derived from operating an icebreaker in extreme latitudes. This abstract shows preliminary results of crewmember sleep.
Methods: A naturalistic longitudinal approach assessed 53 of the ship's crewmembers (median age of 29yrs; 71.7% males; 66.0% enlisted) while performing their normal duties during a

36-day transit from Kodiak, AK (8/26/23) to Tromsø, Norway (1/10/23). Participants wore ŌURA rings and completed weekly questionnaires throughout the study. Mixed effects analysis was used to assess the effect of age, occupational group, time underway, and watchstanding status on variables of interest. Results are presented as mean□standard deviation.

Results: Over the entire data collection period, participants' sleep duration was 6.81□0.57 hrs/day with 68.9% sleeping < 7 hrs/day and 8.89% sleeping < 6 hrs/day. All participants napped at least once; 68.1% napped at least once every 4 days. Self-report sleep regularity index (SRI; lower numbers translate to poorer sleep) was 73.1□5.80 for watchstanders, 83.8□6.19 for non-watchstanders, and 78.3□5.16 for crewmembers with a hybrid work schedule. Age was associated with decreased heart rate variability (p=0.006), increased percentage of light sleep (p< 0.001), decreased percentage of deep sleep (p< 0.001), and increased percentage of REM sleep (p=0.021). Officers and watchstanders had a lower percentage of REM sleep compared to enlisted (p=0.030) and non-watchstanders (p=0.025) respectively. Also, over the course of the underway the percentage of light sleep increased and the percentage of deep sleep decreased. Specifically, compared to Week 1, Week 3 had a higher percentage of light sleep (p=0.027), and a lower percentage of deep sleep (p=0.019).

Conclusion: Results showed that Arctic operations can affect crew sleep. Crew members slept less than the daily recommended 7+ hr/day sleep duration. Their sleep was also related to age, watchstanding status, and time underway.

Support (if any):

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0181

NREM DELTA POWER IS CONSERVED IN NIGHTTIME RECOVERY SLEEP AFTER REPEATED SIMULATED NIGHTSHIFT DUTY CYCLES

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Introduction: Slow wave sleep (SWS) has been reported to be conserved, relative to baseline, across days in schedules with repeated simulated nightshift duty cycles. We investigated whether this SWS characteristic extends to delta power (0.6–4.0Hz) in the NREM sleep EEG of nighttime sleep after each of two consecutive nightshift duty cycles, to quantify post-duty homeostatic recovery.

Methods: N=27 health adults (ages 22–39y; 13f) completed a 14-day laboratory study. After 10h nighttime baseline sleep (TIB 22:00–08:00), subjects were randomized to a simulated dayshift condition (n=15; 6f) with all nights 10h TIB (22:00–08:00) or a simulated nightshift condition (n=12; 7f) with two repeated simulated nighttime duty cycles. Each nighttime duty cycle involved a transition nap (15:00–20:00), 4 consecutive daytime sleep opportunities (10:00–20:00), and another transition nap (10:00–15:00), followed by nighttime recovery sleep (22:00–08:00). Analyses focused on the nighttime baseline sleep and both recovery sleep opportunities in the nightshift condition and the equivalent nights in the dayshift condition. Sleep was scored using AASM criteria and subjected to NREM EEG spectral analysis to assess cumulative delta power for each night. Results were analyzed using repeated-measures ANOVA with factors for condition, night, and their interaction, and covariates for age and sex.

Results: There was a trend for an overall reduction in delta power in the nightshift condition compared to the dayshift condition (F[1,23]=3.0, P=0.097), but no effect of night (F[2,48]=0.51, P=0.60) and no interaction (F[2,48]=0.45, P=0.64). Results were consistent with two-process model simulations of homeostatic pressure, which predicted reduced delta power during recovery sleep in the nightshift condition. The correlation between group-average observations and predictions was 0.44.

Conclusion: NREM delta power was conserved in nighttime recovery sleep after repeated nightshift duty cycles. Compared to nighttime sleep in simulated dayshift, the observed NREM delta power was marginally reduced in simulated nightshift, as moderately correlated with two-process model predictions. The minimal dynamic response to simulated nightshift in NREM delta power is congruent with observations in repeated cycles of simulated dayshift with sleep restriction, and may underlie cumulative deficits in neurobehavioral performance across repeated nightshift duty cycles.

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0182

DISTINCT SPECTRAL PATTERN OF COGNITIVE, DROWSINESS, AND FATIGUE-RELATED THETA/ALPHA EEG ACTIVITY DURING WAKEFULNESS

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Introduction: Increases in midfrontal theta (4-8 Hz) EEG power have been observed in two markedly different conditions: during high cognitive demand, and when experiencing sleepiness or tiredness. Theta power increases during engagement in attention, working memory, or cognitive control processes. However, sleep restriction and mental fatigue also cause widespread increases in theta/alpha (9-13 Hz) power. Interestingly, these phenomena with potentially similar topography have contradictory interpretations: first, as a marker of cognitive control; and second, as local sleep waves in the awake state, which reflect homeostatic sleep pressure that is detrimental to cognition.

Methods: In this study (N=22), we explored this paradox by implementing a psychomotor vigilance task in an overnight EEG study, during a 12-hour sleep deprivation period. We investigated which EEG dynamics were linked to sleep pressure, time-on-task, and task performance. We applied a linear mixed-effect model incorporating time-of-night, run number, and response time (RT) variables to pre-stimulus and post-stimulus time epochs in a trial-by-trial fashion. Additionally, another model accounting for omission vs. correct trials was run to capture spectral dynamics of attentional lapses.

Results: In line with the views that theta reflects ongoing cognitive processing, midfrontal low-theta power (peak at 4.2 Hz) showed a positive stimulus-related correlation to RT. The time-of-night effect revealed a persistent widespread increase in the high-theta band (peak at 8 Hz) over time. Further, omission trials were marked with decreased power in that particular frequency range at the central EEG channels suggesting that high theta reflects compensatory mechanisms. Finally, the time-on-task effect showed a pronounced centroparietal increase in alpha power (peak at 10 Hz) for both pre-and post-stimulus epochs. Interestingly, activity in this oscillatory range with similar

topography showed negative RT correlations indicating another form of compensatory mechanism that speeds up responses.
Conclusion: Our results indicate that cognitive effort, drowsiness, and fatigue processes can be disentangled by distinct spectral and topographical EEG characteristics. Moreover, neither high theta nor alpha power could be interpreted as a local sleep phenomenon due to their beneficial effects on performance. Furthermore, this work provides a basis for neuroimaging investigations of the neural circuit dynamics underlying these distinct oscillatory patterns.
Support (if any):

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0183

SLEEP LOSS AND EMOTION: A SYSTEMATIC REVIEW AND META-ANALYSIS OF OVER FIFTY YEARS OF EXPERIMENTAL RESEARCH

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Introduction: Studies on the impact of sleep on emotional experiences have rapidly proliferated in recent decades. While evidence suggests that poor sleep serves as a catalyst for the development of emotional difficulties, specific relationships have been difficult to disentangle. Thus, a comprehensive quantitative synthesis is needed to integrate and consolidate findings across this heterogeneous research literature.
Methods: This pre-registered systematic review and meta-analysis included studies that experimentally reduced sleep (i.e., total sleep deprivation, partial sleep restriction, or sleep fragmentation) in healthy populations to examine effects on positive affect, negative affect, emotional reactivity, anxiety symptoms, and/or depressive symptoms. In total, 1338 effect sizes from 154 studies were included (total participants N = 5,717; age range = 7-79 years; 50.14% female).
Results: Random effects models found that all forms of sleep loss resulted in reduced positive affect (standardized mean difference [SMD] = -0.27 to -1.14), with some evidence that high arousal positive states were most adversely affected. Sleep loss also increased anxiety symptoms (SMD = 0.57 to 0.63) and blunted subjective arousal in response to emotional stimuli (SMD = -0.20 to -0.53). Findings for negative affect, reports of emotional valence in response to emotional stimuli, and depressive symptoms were mixed. Some non-linear effects emerged based on the hours of wakefulness induced or the sleep opportunity provided. Some effects were also moderated by study characteristics, age, and sex, although findings varied by type of sleep loss and emotional outcome. Differences emerged based on type of sleep restricted (i.e., rapid eye movement sleep or slow wave sleep), with greater reports of negative valence in response to emotional stimuli after loss of rapid eye movement sleep (SMD = 0.35, p = .023) compared to loss of slow wave sleep (SMD = 0.09, p = .088).
Conclusion: This study synthesizes more than 50 years of experimental research to reveal how periods of extended wakefulness, shortened sleep duration, and/or nighttime awakening undermines human emotional functioning and increases risk for psychiatric disorders. Findings provide an integrative foundation for future research on sleep and emotion and elucidate the precise ways that inadequate sleep may impact daytime emotions.
Support (if any): N/A

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0184

GRATITUDE, FLOURISHING, AND PROSOCIAL BEHAVIORS FOLLOWING EXPERIMENTAL SLEEP RESTRICTION AND SLEEP EXTENSION

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Introduction: People who are grateful, resilient, and flourishing in life show better health, including better sleep. This correlational finding is typically attributed to personality factors or to positive outlooks causing better sleep. We investigated the reverse causal interpretation: do sleep losses and sleep gains affect feelings and expressions of gratitude, resilience, and flourishing?
Methods: 90 adults were randomly assigned to late bedtimes, early bedtimes, or to sleep normally across a single workweek (monitored by actigraphy). The primary outcomes were changes in state and trait feelings of flourishing, resilience, and gratitude, as well as behavioral expressions of gratitude (i.e., gratitude list writing).
Results: Relative to the natural sleep condition, early bedtimes extended sleep by 46 minutes/night and late bedtimes reduced sleep by 37 minutes/night (actigraphy-defined). Subjective sleepiness and mood disturbances improved with sleep extension and worsened with sleep restriction. State-level measures of flourishing, resilience, and gratitude significantly improved across the week with sleep extension and significantly worsened with sleep restriction (ηp2 = .13 to .17). Trait-level measures showed modest or no changes. Sleep-extended participants wrote twice as much on their gratitude list as the other two conditions (ηp2 = .11). Most effects persisted when accounting for mood.
Conclusion: Subtle changes in nighttime sleep can affect gratitude, resilience, and flourishing. Addressing sleep health in society may be foundational to overall well-being and prosocial behaviors in the population.
Support (if any): Support provided by an URSA grant, the National Science Foundation (1920730, 1943323), and the John Templeton Foundation (61513).

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0185

VIDEO GAME ADDICTION AND ITS RELATIONSHIP WITH SLEEP QUALITY AMONG MEDICAL STUDENTS

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Introduction: Problematic video game playing has grown vastly in the past decade with internet addiction and has caused many public health problems. Among these problems is the poor sleep quality as a result of gaming addiction. Given the significant increase in video game sales, it is important to determine the prevalence of gaming addiction among medical students and whether it is associated with poor sleep quality which may be reflected on the academic performance.

Methods: A cross-sectional survey was conducted between January and June of 2023 on medical students of King Abdulaziz University, Jeddah, Saudi Arabia. An online survey was used and was divided into three sections. The first section included demographic data. The second section included the 7-item Gaming Addiction Scale (GAS), and the third section included the Pittsburgh Sleep Quality Index (PSQI). Using GAS Scale and based on the total score, gamers are classified as addicted, problematic, engaged, or normal. Hence, abnormal gamers include engaged gamers, problematic gamers, and addicted gamers.
Results: There were 357 participants with mean age of 22.5 -/+ 1.8 years and 75.3 % were males. The data showed that 38.8% of the study population were abnormal gamers: 40 (11.2%) engaged gamers, 81 (22.8%) problematic gamers and 17 (4.8%) addicted gamers. Furthermore, abnormal gaming was linked to poor sleep quality when comparing abnormal gamers with normal gamers (92% VS 80.3%, p value of 0.002). Abnormal gamers were found to rely on sleep medication to help them sleep at night and take longer time to fall asleep (p=0.050 & p=0.045 respectively).
Conclusion: Abnormal gaming is common among medical students and it is strongly associated with poor sleep quality.
Support (if any):

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0186
EXPERIMENTAL SLEEP RESTRICTION AFFECTS ARTWORK PERCEPTIONS

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Introduction: Sleep deprivation is known to detrimentally affect attention, memory, and other cognitive processes. Less is known about whether and how sleep loss influences perception, such as the aesthetic experience of viewing art, which serves as a conduit for social bonding, creative expression, and life enrichment. In the current work, we tested perceptions of abstract artwork after normal sleep and sleep restricted periods.
Methods: Sixty-four young adults (mean age=19.98, 53.2% female, 54.8% non-Caucasian) were enrolled in a cross-over designed, in-laboratory study. Following an adaptation night, participants were randomly assigned to undergo two nights of sleep restriction (1:30 AM – 7:00AM) or two nights of normal sleep (10:00 PM – 07:00AM), with polysomnography recordings. In the morning, participants viewed 12 abstract paintings, each for 15 seconds coupled with a female artist's name or male artist's name (randomized across paintings). After each painting, participants rated the painting's beauty, colorfulness, skillfulness, creativity, and how much they liked it overall. During the next week, participants completed the other sleep condition (order counterbalanced) with a new set of abstract paintings and artist names.
Results: We conducted a series of 2 (sleep condition) x 2 (artist gender) x 2 (participant gender) ANOVAs. Males tended to favor male artwork, and females tended to favor female artwork, but gender effects were not statistically significant (ps>.10). Interestingly, sleep restriction significantly reduced how much participants rated liking the artwork (p=0.009) and tended to reduce perceptions of the beauty of the artwork (p=.051). Perceptions of colorfulness, skillfulness, and creativity were not significantly affected (ps>.10).
Conclusion: Sleep loss can subtly affect perceptions of artwork, generally by dampening the aesthetic experience. Future work should investigate economic and cultural impacts of sleep loss, and how short sleep in artists affects their creative output.
Support (if any): Support provided by the National Science Foundation (1920730).

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0187
EMPATHY AND PUNISHMENT RATINGS FOR COPYRIGHT INFRINGEMENT IN RESTED AND SLEEP RESTRICTED INDIVIDUALS

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Introduction: Sleep restriction can worsen cognitive functioning and alter emotional regulation. Recent studies further indicate that sleep deprivation reduces empathy and increases willingness to punish others for mistakes. We built on this emerging literature by presenting rested and sleep restricted individuals with vignettes of people who had been victimized (e.g., forgery, plagiarism), with a focus on how much the offenders should be punished and how much the victims should be compensated.
Methods: Participants included 62 young adults (mean age = 20.03, 51.6% female, 45.2% non-Hispanic white) who first completed a laboratory polysomnography adaptation night. Afterward, participants were randomly assigned to either two laboratory nights of restricted sleep (1:30 AM – 7:00AM) or two laboratory nights of normal sleep (10:00 PM – 07:00 AM). In the morning, participants were presented with vignettes depicting copyright fraud such as shoe companies using trademarked features, music companies sampling melodies without credit to the original songwriter, and art forgers who sold painting replicas to art enthusiasts as if they were the originals. Participants were asked to rate the seriousness of the mistakes, how much punishment the offenders deserved, if the offender should be jailed or prevented from working in the field, and how much the victims should be compensated.
Results: Relative to rested participants (M=6.1), sleep restriction significantly reduced participant ratings of victim compensation (M=5.3), even when accounting for ratings of the severity of copyright infringement (F=7.1, p=.01, eta squared=0.12). Other perceptions of the seriousness of the mistakes or how much the offenders should be punished were not significantly changed (ps>0.05). There were no gender differences or gender by sleep condition interactions.
Conclusion: Two nights of mild sleep restriction were sufficient to reduce empathy for victims of copyright infringement. Additional work is needed to understand dose-response relationships between sleep loss and empathy and punishment.
Support (if any): Support provided by the National Science Foundation (1920730)

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0188
IMPACT OF THE MENARCHEAL TRANSITION ON SLEEP IN BIOLOGICAL FEMALES

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Introduction: Puberty encompasses a multitude of physical, hormonal, and psychological changes. Additionally, adolescents also experience a delay in circadian rhythm, increasing their vulnerability to insufficient sleep. Even though puberty and sleep share a strong association, few studies have explored the shift in sleep after the onset of menstruation (i.e., menarche). This longitudinal, multimethod study examines sleep health parameters before and after menarche among a community sample of females.
Methods: Biological females (n = 47; 74% white) from a Midwestern metropolitan area were recruited as part of a larger study on menarche. Participants completed two lab visits: Time 1 (T1: prior to menarche; Mage = 11.3, SDage = 1.0) and Time 2 (T2: 3-9 months post-menarche; Mage = 12.6, SDage = 1.0). An actigraph wristwatch was worn for 7 days following each lab visit to measure dimensions of sleep health including bedtime, wake time, time in bed, and total sleep time. Phillips Actiware Software was used to score actigraphy data; SPSS 27 was used to perform paired sample t-tests to explore changes over time.
Results: Following menarche, there were significant differences in several parameters of sleep health including: 1) a 1.7-hour delay in bedtime (T1M = 21:45, T1SD = 1:02; T2M = 23:29, T2SD = 3:07, t(46) = (3.37), p = (.002), 2) less time in bed (T1M = 542, T1SD = :48; T2M = 518, T2SD = :58), t(46) = (2.67), p (.01), and 3) a 27-minute decrease in total sleep time (T1M = 482, T1SD = :40; T2M = 455, T2SD = :51), t(46) = (3.32), p = (.002). Overall, these results indicate participants are sleeping significantly less in the months following menarche.
Conclusion: Findings confirm that biological females experience changes in sleep behaviors within 9 months of menarche. Chronic sleep loss and daytime sleepiness worsens throughout adolescence, furthering the risk for cognitive and behavioral issues. Data collection is ongoing and future analyses will examine sleep variability across this transitional point in development. This is one of the first studies to examine the sleep-wake experience of females across menarche.
Support (if any):

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0189

MENSTRUAL CYCLE PHASE AND ALCOHOL USE INTERACT TO INFLUENCE DAILY SLEEP OUTCOMES

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Introduction: Rates of heavy drinking are increasing in women at an alarming pace. Studies suggest that although alcohol has an initial sedative effect, it can lead to frequent awakenings. Preliminary studies suggest that women may be more sensitive to alcohol-disrupted sleep than men. Women's sleep changes across the month due to the impact of cycling hormones, yet studies examining links between alcohol-disrupted sleep and menstrual cycling are scarce. Here, we used daily diary methods to track menstrual cycles, sleep, and alcohol use in normal cycling women.
Methods: 44, cisgender women, aged 18-45, completed morning and nightly diaries to track sleep/wake behavior, alcohol use, and menstrual cycling for two weeks (N=586observations). Each morning, participants reported bedtime and waketime and the number of minutes it took them to fall asleep, which was used to determine sleep duration and onset latency, respectively. Sleep quality was assessed on a Likert scale of 1='very bad' to 4='very good' and morning ratings of refresh on a Likert scale of 1='not at all' and 7='completely'. Prior to sleep, participants indicated if they drank any alcohol, and if so, how many drinks they ingested. We examined the impact of on vs. off menses as well as day in cycle – early-follicular, late-luteal, or periovulatory – on alcohol use and sleep outcomes using linear mixed effects models.
Results: On average, participants went to bed at 12:18AM, woke up at 7:59AM, slept 8hrs and 17mins, and had sleep onset latencies of nearly 16mins. Participants reported good sleep quality (M=3.14) and feeling relatively refreshed (M=5.14) upon awakening. On menses, drinking was associated with longer sleep onset latencies (r=.216). Off menses, drinking was associated with lower sleep quality (r=-.125) and ratings of morning refresh (r=-.214). On days when women drank alcohol, they also had marginally worse sleep quality (p=.056). Periovulatory vs. early-follicular days were associated with less ratings of morning refresh (p=.019), and a marginal interaction between phase and alcohol suggested that drinking alcohol during the periovulatory phase led to significantly lower feelings of refresh the next morning (p=.076).
Conclusion: These data suggest that sleep may be more sensitive to alcohol disruption near ovulation in women.
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0190

TIME-IN-BED CLASSROOM-BASED SLEEP CHALLENGES: 5-MONTH FOLLOW-UP OUTCOMES

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Introduction: Half of college students routinely sleep < 7 hours/night and sleep restriction is often even worse when preparing for exams. In prior work, we found that offering extra credit opportunities to extend one's nightly time-in-bed during final exam week significantly increased actigraphy-defined total sleep time. In the current work, we repeated actigraphy monitoring in students who took the sleep challenge to investigate the durability of sleep benefits during the following semester.
Methods: Seventy-four students in Fall 2022 completed baseline questionnaires and actigraphy monitoring 11 weeks before taking a sleep challenge during final exam week (both occurred only on weekday nights). During the sleep challenge, students could earn five extra credit points if they extended their average time-in-bed to 9 hours/night. During the following spring semester (11 weeks post-challenge), students were invited to participate in a follow-up study in which they repeated questionnaires and actigraphy monitoring. There were no extra credit incentives offered during the follow-up monitoring period. Participants provided informed consent and the class instructor was kept blinded to which students participated in the follow-up.
Results: 62% of participants were still enrolled at the university and agreed to participate in the follow-up study. Those who completed the follow-up study were comparable to those lost to follow-up in demographics, baseline GPA, baseline PSQI, baseline chronotype, and fall semester final exam grade (ps>.05). The initial extra-credit incentive during the fall semester increased total sleep time by 44 minutes on average; approximately half of this benefit was retained during the spring semester. Relative to baseline (6.75 ± 0.84 hours), students showed 24 minutes/night more total sleep time five months later (7.14 ± 0.98 hours;

p<.003), without a change to sleep efficiency (82.9% versus 82.5%, p>.05). Actigraphy-defined total sleep time at the spring semester follow-up was statistically comparable to total sleep time during the fall semester sleep challenge week (p>.05). Demographic and academic variables were not significant predictors of individual likelihood of maintaining sleep benefits at follow-up.
Conclusion: Incentive-based approaches to encouraging healthier sleep habits can have a sustained benefit in student groups.
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0191
EVALUATING SLEEP INTRA-INDIVIDUAL VARIABILITY: RELATIONSHIPS WITH SLEEP QUALITY, SLEEPINESS, AND TIME MANAGEMENT

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Introduction: Intra-individual variability (IIV) in sleep is increasingly studied for its association with health, beyond mean sleep characteristics. However, measuring sleep IIV can be challenging without actiwatches or multi-day sleep diaries. To enable efficient one-time assessment of IIV in various sleep domains, we developed and updated the Sleep Intra-individual Variability Scale version 2 (SIIV). We evaluated the internal consistency of the SIIV and investigated the relationship between sleep IIV, sleep quality, sleepiness, and time management.
Methods: We asked 374 first-year college students (mean age=18.34, SD=0.85; 73.26% female) to complete the SIIV, the Pittsburgh Sleep Quality Index, Epworth Sleepiness Scale, and the Time Management Questionnaire. The SIIV asked for typical sleep characteristics on every day of the week, in five domains: bedtime, risetime, total sleep time (TST), sleep onset latency (SOL), and napping. Individual standard deviations of sleep characteristics were calculated to represent IIV in sleep domains. Cronbach's alpha, t-tests, and Pearsons' correlations were conducted.
Results: IIVs in the five sleep domains were relatively independent (Cronbach's alpha=0.39). We found a strong correlation between IIVs in TSTs and IIVs in risetimes (r=0.60, p< 0.001), but all other domains were weakly-to-moderately correlated (rs<.30). Non-white students reported greater IIV in TST than white students (non-white: 1.00±0.60h; white: 0.83±0.54h; p=0.005) and risetime (non-White: 74.86±40.88min; White: 65.82±36.19min; p=0.027). Females reported greater IIV in SOL than males (females: 4.92±5.07min; male: 3.35±3.91min; p=0.002). After controlling for mean sleep characteristics, poorer sleep quality was associated with greater IIV in TST (r=0.30, p< 0.001), risetime (r=0.19, p< 0.001), and SOL (r=0.16, p=0.002). Greater IIV in TST (r=0.16, p=0.002) and SOL (r=0.21, p< 0.001) also correlated with greater daytime sleepiness, after adjusting for mean TST and SOL, respectively. In addition, greater IIV in TST (r=-0.12, p=0.021) was associated with poorer time management, after adjusting for mean TST.
Conclusion: Greater IIV in sleep, especially TST, was associated with demographics, poor sleep quality, sleepiness, and poor time management. A single timepoint, self-reported measure of IIV increases the feasibility of estimating nightly consistency/regularity across five sleep domains.
Support (if any): National Science Foundation (1920730 and 1943323)

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0192
BRAIN CIRCUITS THAT REGULATE AWAKENINGS TO PAIN STIMULUS

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Introduction: Many neurons in the external lateral PB express the calcitonin gene-related peptide [CGRP; PBelCGRP], and also receive spinal afferents carrying pain signals that are relayed to forebrain arousal promoting areas. Thus, PBelCGRP neurons form the critical relay node transmitting pain to induce cortical arousals. We tested this with genetic deletion or acute optogenetic inhibition in both inflammatory pain and opto-pain models, and found that blocking this node prevents pain-induced arousals. Our current focus is on understanding which terminal fields of the PBelCGRP neurons contribute to pain-induced wakefulness.
Methods: Using pharmacological antagonists and optogenetics, we blocked PBelCGRP neuron terminal fields located in the basal forebrain (BF), bed nucleus of stria terminalis (BNST), and central nucleus of Amygdala (CeA). For pharmacological blocking, wild type mice implanted with a guide cannula targeting one of the terminal fields received bilateral microinjections of NMDA antagonist (AP-5, 4.0 µg/200nl), or CGRP receptor antagonist (BIBN4096BS at 8 µg/200nl). For optogenetic (opto) blocking, CGRP-CreER mice injected bilaterally in the PB with AAV-Flex-Opn3-mscarlet (inhibitory opsin) and implanted with bilateral optical fibers in the terminal fields received laser light pulses for opto-inhibition. Both groups were implanted and recorded for sleep following acute inflammatory pain (AIP) of a 10 µl foot injection of 5% formalin in combination either with or without terminal field blocking.
Results: The effects on sleep-wake after pharmacological blocking or opto-inhibition were compared to saline and AIP groups. AIP induced a robust 54% decrease in sleep for 3h post-injection (F1, 17= 105; P< 0.001) compared to saline. Preceding NMDA antagonist injections in the BNST and BF reversed AIP-induced sleep-loss by 95% (F4, 28= 17.1; P< 0.001), followed by CeA (83% reversal). While blocking CGRP receptors (F4, 28= 12.2; P< 0.001) followed the order BF> BNST> CeA for recovering AIP-induced sleep loss. A similar order of effect (F4, 23= 31.6; P< 0.001) was produced by opto-inhibition of PBelCGRP neuron terminal fields at BF, BNST and CeA.
Conclusion: Our results show that PBelCGRP neurons likely target BF, BNST, and CeA by acting through both CGRP and NMDA receptors to promote awakenings in response to acute pain.
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0193
THE EFFECT OF SLEEP DEPRIVATION ON PAIN PERCEPTION IN AWAKE RATS

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Introduction: This study was conducted to determine how sleep deprivation affects headache perception and brain structure in an animal model of headache.
Methods: The effect of sleep deprivation on mechanical pain threshold was assessed in two groups of animals: (i) NSD-C group and (ii) SD group. The VFMF thresholds were assessed every day during 96 hours of sleep deprivation. After 96 hours sleep deprivation, the brain of each groups were analyzed with immunohistochemistry staining. The effect of sleep deprivation in supradural capsicin infusion were assessed in two groups. The VFMF threshold was performed during sleep deprivation and 4 weeks of recovery phase.
Results: 1) The effect of sleep deprivation on mechanical pain threshold. In comparison between SD and NSD-C group, the significant difference appeared after 1 day of sleep deprivation and lasted 4 days. 2) The effect of sleep deprivation on FOS reactivity. In hyptothalamus, the number of Fos-positive cells in PoHT increased significantly in SD group compared NSD-C group. In PAG, the number of Fos-positive cells in VLPAG increased significantly in SD group compared NSD-C group. The number of Fos-positive cells of supf C in TCC increased significantly in SD group compared NSD-C group. 3) The effect of sleep deprivation on mechanical pain threshold in supradural capsicin infusion. SD-Capsicin showed the tendency of lower VFMF threshold compared to NSD-Capsicin, which reach to statistical significant 3rd days of capsicin infusion period. During the recovery phase, the reduced VFMF threshold of NSD-Capsicin group was persisted 1 week after sleep deprivation and returned to baseline thereafter. In SD-Capsicin group, the reduced VFMF threshold was persisted 3 week after sleep deprivation.
Conclusion: In this study, pain lasted for 1 week after 4 days of continuous infusion of capsicin without sleep deprivation, but lasted for more than 3 weeks when combined with sleep deprivation, confirming the possibility that sleep deprivation contributes to the chronicity of headache. The chronicity and persistence of headache is associated with the centralization of pain. The findings of this study that sleep deprivation results in changes in TNC activity, which plays an important role in centralization, support this possibility.
Support (if any):

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0194

IMPACT OF SLEEP DEPRIVATION COMBINED WITH ALCOHOL OR OXYCODONE ON SLEEP ARCHITECTURE IN HEALTHY YOUNG ADULTS

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Introduction: Alcohol and opioids disturb sleep, but the impact of substance use on recovery sleep after sleep deprivation is largely unknown. Here we piloted a study protocol to assess the combined impact of total sleep deprivation (TSD) and substance administration on recovery sleep.
Methods: N=6 healthy normal sleepers (ages 28.2±5.6y; 4 males) completed two 24h laboratory study sessions. During each session, which began at 15:00, participants were kept awake for 15h until 06:00 the next day. They were then given an 8h recovery sleep opportunity (06:00–14:00) and went home. During the second study session, participants were randomly assigned to receive alcohol (n=3; peak BAC of 0.043±0.008% at 00:55, decayed to zero by 06:00) or an opioid (n=3; 10mg oxycodone administered at 22:30). Recovery sleep was recorded polysomnographically and scored using AASM criteria; analyses focused on total sleep time (TST), sleep efficiency, sleep latency, sleep stages N1–N3 and REM, and latency to each of the sleep stages.
Results: Session 1 (pre-substance) TST was considerably shorter in the opioid group (282±28min) than the alcohol group (403±24min). Therefore, we analyzed sleep variables for the two groups separately, using mixed-effects ANOVA with a fixed effect for study session (TSD vs. TSD+drug) and a random effect over subjects on the intercept. For the opioid group, latency to N3 sleep was significantly longer by 10±2min after opioid administration compared to TSD alone ($F=33.8$, $p=0.028$). There were no significant effects of TSD+alcohol compared to TSD alone.
Conclusion: Opioid administration during TSD delayed N3 onset, but no other effects of opioid or alcohol administration were seen during recovery sleep. Our sample was small, but the within-subjects study design provided considerable statistical power – substance effects on neurobehavioral performance during TSD (reported elsewhere) were readily detectable. However, BAC at the onset of recovery sleep had decayed to zero, and elevated homeostatic sleep pressure from TSD may have negated any residual substance effects other than the opioid-induced delay in N3. Investigating the impact of substances on recovery sleep after TSD, as well as post-recovery neurobehavioral functioning, is important for safety and health in today's sleep-deprived society.
Support (if any): National Safety Council

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0195

TECHNOLOGY FOR INSOMNIA IN ADOLESCENT AND YOUNG ADULT CANCER SURVIVORS: A THEMATIC ANALYSIS

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Introduction: An estimated 53% of adolescent and young adult (AYA) cancer survivors report insufficient sleep, which is associated with an increased risk of cardiovascular disease and reduced quality of life. This study aims to qualitatively explore 1) the experiences of insomnia in AYA cancer survivors; 2) strategies employed to address sleep problems; and 3) potential implementations of technology that could improve sleep quality among AYA cancer survivors.
Methods: Two virtual focus groups were conducted with AYA cancer survivors with current insomnia (n=7) to explore their insomnia experiences, strategies used to address insomnia, and perceptions of technology to promote sleep quality. Data were analyzed using thematic analysis through a hermeneutic philosophical approach.
Results: All participants were female (age range: 28 – 36 years) and had a previous diagnosis of breast cancer, ovarian cancer, or lymphoma. The average duration since diagnosis was 1.7 years (range: 1 – 3 years). Three themes were generated: (1) experiences of insomnia, (2) insomnia coping strategies, and (3) ideas for technology to help with sleep. The participants reported difficulties in initiating sleep (71.4 %), maintaining sleep (28.6%),

04and early awakening (57.1%). Insomnia was connected to stress, anxiety, fatigue, and stomach problems. To cope with insomnia, several strategies were employed: prescription and over-the-counter sleep medication: melatonin or cannabidiol, meeting with counselors, psychiatrists, or medical doctors, modifying their living patterns, and using technology. AYAs showed a positive sentiment toward using technology for sleep problems, and their current technology use included meditation content, tracking sleep or physical activity patterns, and sleeping applications. They suggested future designs that integrate technology to help improve sleep including sleep trackers, daily reminders, meditation videos, and user-friendly interfaces.

Conclusion: Here we report that AYA cancer survivors with insomnia used multiple strategies to address their insomnia, including technology, and showed a willingness to further utilize technology to assist them. The insights from this study can inform the design of insomnia interventions for AYA cancer survivors and can be further investigated in larger studies and with male AYA cancer survivors.

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0196

ONE LESS PATHWAY TO EXPLAIN THE CHRONIC INSUFFICIENT SLEEP AND METABOLISM RELATIONSHIP: THYROID REGULATION

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Introduction: Chronic insufficient sleep contributes to the development of obesity and type 2 diabetes (T2D). However, the physiologic underpinnings of these effects are incompletely understood. There is some evidence that sleep restriction (SR) adversely affects thyroid hormones and growth factors involved in energy metabolism, but findings are mixed. Furthermore, no study has evaluated changes in thyrotropic axis hormones in response to a model of chronic, mildly insufficient sleep resembling real-world short sleep. Therefore, we investigated whether 6wk of 1.5 h/night SR vs. maintenance of adequate sleep (AS) impacted free thyroxine (T4), thyroid stimulating hormone (TSH), and fibroblast growth factor-21 (FGF21) in healthy adults.

Methods: Men and women with actigraphy-assessed habitual total sleep time (TST) of 7-9h/night and no cardiometabolic diseases participated in a randomized, crossover study with two 6-week phases: AS and SR. Sleep was monitored daily with actigraphy, and compliance was assessed every 1-2wk. Blood was collected following a ≥12h fast at baseline, wk 3, wk 4, and endpoint of each phase. For this investigation, circulating levels of T4, TSH, and FGF21, within an all-female subsample (n=18), were quantified from plasma. Linear mixed models tested the effect of SR on the post-baseline values of the outcomes, with models adjusted for corresponding baseline outcome values, week, and phase.

Results: Data were available from 30 participants (20 women, 39.0±14.0y, BMI: 26.7±3.6; 10 men, 29.4±5.2y, BMI: 26.6±2.2). T4, TSH, and FGF21 concentrations at the baselines of each phase ranged from 0.27-2.55 ng/dL (M±SD: 0.87±0.47), 0.86-1.66 μIU/ml (M±SD: 1.24±0.19) and 17.5-383.3 pg/mL (M±SD: 140.2±97.6), respectively. In the full sample free T4 (β=-0.02, p=0.64) and TSH (β=0.02, p=0.67), and in the subsample, FGF21 (β=-1.57, p=0.83) were not significantly different between study arms. In analyses of T4 and TSH stratified by sex, there were no differences between study arm.

Conclusion: In a sample of healthy adults, prolonged mild sleep restriction did not cause alterations in thyroid hormones and FGF21. These findings suggest that adverse endocrine and metabolic consequences commonly observed with chronic short sleep are not owed to disruptions in the thyroid axis endocrine pathway.

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0197

EXOGENOUS GRP78 MODULATES SLOW-WAVE SLEEP AND PROVIDES NEUROPROTECTION IN A RAT MODEL OF CHRONIC SLEEP RESTRICTION

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Introduction: Glucose-regulated protein 78 (GRP78) is the main chaperone of endoplasmic reticulum (ER) lumen and main regulator of the ER-stress response contributing to the survival of neurons. Sleep deprivation (SD) enhances GRP78 expression and initiates ER-stress in the mouse cerebral cortex (Naidoo et al., 2005). In Drosophila, GRP78 overexpression increases recovery sleep in response to SD and delays ER-stress. Here we explore i) which phase of sleep is GRP78 involved in, ii) what is the neuroprotective significance of increasing GRP78 levels in the brain in a model of chronic sleep restriction (CSR)

Methods: Intracerebroventricular administration of the human recombinant GRP78 (rGRP78) and CSR experiment were performed in male Wistar rats. Continuous EEG, EMG and EOG recording was performed using a 4ET telemetry module (DSI). The CSR model was created using cycles of 3 h of sleep deprivation and 1 h of sleep opportunity continuously for 5 days on the orbital shaker (160 rpm). In the CSR model, rGRP78 was delivered intranasally 2 days before CSR and during the CSR period. Immunohistochemistry and immunoblotting were used to evaluate the protective properties of GRP78.

Results: Intracerebroventricular microinjections of rGRP78 at the beginning of the inactive period caused an increase in the slow-wave activity and the amount of slow-wave sleep (SWS) due to the prolongation of SWS episodes. In addition, a slight decrease in paradoxical sleep amount was observed. Thus, GRP78 can be involved in the molecular mechanisms of SWS maintenance, which plays an important role in accelerating protein synthesis and glymphatic clearance. During CSR, aforementioned functions of SWS are violated, which leads to the development of molecular dysfunctions and neurodegeneration. Our CSR model was characterized by degeneration in monoaminergic structures (locus coeruleus, substantia nigra pars compacta, ventral tegmental area) of the brain and activation of apoptotic PERK/CHOP branch of ER-stress. Exogenous rGPR78 attenuated both neurodegeneration and apoptotic ER-stress branch response.

Conclusion: The findings indicate that GRP78 possesses neuroprotective traits that are associated with its ability to increase SWS and modulate ER stress.

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0198

THE INFLUENCE OF SHANK3 MUTATIONS ON SPINDLE ACTIVITY DURING SLEEP IN A MOUSE MODEL

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Introduction: Insomnia, characterized by problems falling asleep, less sleep, and a lower quality sleep, is more prevalent among individuals with autism spectrum disorders (ASD) compared to typical development. Insomnia in ASD predicts severity of symptoms and impacts quality of life, however the mechanisms linking poor sleep with ASD are not well understood. Genetic mouse models of ASD have been essential to understanding ASD. We previously showed that mice with a deletion in exon 21 of Shank3 (Shank3ΔC), a high confidence ASD gene, recapitulate the clinical sleep-onset insomnia ASD phenotype. Sleep spindles are an important part of sleep quality thought to indicate restorative effects of sleep on information processing and cognition. Prior work in humans suggests that people with ASD have a lower spindle density. The goal of our study was to investigate spindle activity using the Shank3ΔC mouse model, to provide a valid pre-clinical model for testing future interventions.
Methods: Sleep phenotyping of 12-week-old adult Wild Type (WT) and Shank3ΔC male mice was performed using electroencephalography (EEG), frontal and parietal cortices bilaterally, and electromyography (EMG). Recordings consisted of 24-hours of baseline, 5-hours of sleep deprivation and 19-hours of undisturbed recovery sleep. EEG/EMG data was used to manually determine vigilance states using SleepSign for Animal and then analyzed with custom Matlab code to detect spindles. The custom Matlab code bandpass-filtered raw EEG data which was then cubed RMS-transformed to define thresholds utilized to identify spindles.
Results: Preliminary results suggest that Shank3ΔC mice have an overall decrease in spindle density (spindles per minute of NREM) compared to WT mice during the dark period post sleep deprivation. This decrease of spindle density in Shank3ΔC mice allows us to further explore spindle density at NREM-REM and Wake-NREM transitions and look for spindle deficits through development in a pre-clinical model of ASD.
Conclusion: Shank3ΔC mice are an effective pre-clinical model for understanding the mechanisms underlying poor spindle quality in ASD across development and developing targeted interventions to normalize spindle density.
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0199

CIRCADIAN MISALIGNMENT, CARDIAC-AUTONOMIC AND INFLAMMATORY PATHWAYS, AND METABOLIC SYNDROME IN ADOLESCENTS

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Introduction: Although insufficient sleep is a known risk factor for metabolic syndrome (MetS), circadian misalignment, which is highly prevalent during adolescence, may also impact cardiac, autonomic and immune regulation. Prior studies have shown that circadian misalignment impacts the association between visceral adiposity (VAT) and MetS in youth, which is not explained by lifestyle factors such as diet or physical activity. We hypothesize that cardiac-autonomic and inflammatory pathways will significantly diminish the impact of circadian misalignment on the relationship between VAT and MetS in adolescents.
Methods: We analyzed 262 adolescents from the Penn State Child Cohort (median 16y; 48% female; 22% racial/ethnic minority) who had at least 5 nights of actigraphy (ACT) and were evaluated while in-school (n=171) or on-break (n=91). They also had 9-h polysomnography (PSG), a dual-energy X-ray absorptiometry (DXA) scan, 24-h Holter-monitoring heart rate variability (HRV), and a composite score of inflammatory biomarkers, including fasting C-reactive protein (CRP), interleukin-6 (IL-6), tumor necrosis factor alpha (TNFα), adiponectin, and leptin data. DXA-measured VAT was the predictor. A continuous MetS score was the outcome. ACT-measured sleep midpoint (SM), sleep irregularity (SI), and social jetlag (SJL) were tested as effect modifiers. Linear regression models were first adjusted for essential covariates (i.e., sex, race/ethnicity, age, ACT-sleep duration, ACT-sleep variability, and PSG-apnea/hypopnea index), and, thereafter, for HRV and inflammatory biomarkers.
Results: Significant interactions were found between VAT and SM, SI or SJL while in-school on MetS adjusting for essential covariates (interaction effects: 0.58 (0.25) p=0.023, 0.38 (0.15) p=0.013, and 0.69 (0.22) p=0.002, respectively). Further adjusting for 24-HRV indices (e.g., Log-HF and RMSSD) or for inflammatory biomarkers did not significantly impact the effect modifications observed (e.g., interaction effects after adjusting for 24-h Log-HF: 0.55 (0.25) p=0.028, 0.36 (0.15) p=0.018, and 0.67 (0.21) p=0.002, respectively).
Conclusion: Cardiac-autonomic or inflammatory pathways do not significantly account for the role that circadian misalignment has in increasing the impact of VAT on MetS burden in adolescents. Other pathways, specific to circadian rhythms either biological or behavioral, may be involved in how circadian misalignment contributes to the development of cardiometabolic sequelae associated with central obesity.
Support (if any): AHA (23PRE1011962), NIH (R01HL136587,R01MH118308,UL1TR000127)

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0200

GREATER SOCIAL JETLAG IS ASSOCIATED WITH HIGHER BMI-Z IN EARLY CHILDHOOD

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Introduction: Misalignment between biological and social timing, as evidenced by the weekend-weekday difference in sleep midpoint, is termed social jetlag (SJL). SJL is associated with higher BMI and obesity in adults, adolescents, and older children; however, to our knowledge, no research to date has addressed SJL and BMI in early childhood. The present study examined the relationship between SJL and BMI-z in young children aged 2.0–8.9 years. We hypothesized that children with greater SJL would have higher BMI-z, before and after adjusting for potential covariates.
Methods: Data were collected from 158 children aged 2.0–8.9 years (M = 5.6 ± 1.98y, 46.2% females) from the RESONANCE cohort of the NIH Environmental Influences on Child Health Outcomes (ECHO) study between 2018–2021. Caregivers completed the ECHO Child Sleep Health Questionnaire and trained staff measured children's height and weight. Age- and sex-adjusted BMI-z was computed (CDC). SJL was calculated as the weekend-weekday difference in nocturnal sleep midpoint. Primary linear regression models adjusted for child age, sex, race, ethnicity, and maternal education; secondary models further adjusted for average sleep duration, weekday-weekend sleep duration difference, and napping frequency.
Results: On average, weekend midpoints were 41 minutes later relative to weekdays ($t(157) = 12.5$, $p < 0.001$). A positive association between SJL and BMI-z was observed in unadjusted and adjusted linear regression models. After controlling for all covariates, SJL remained significantly associated with BMI-z ($R2 = 0.54$, $F(14, 143) = 12.18$, $p < 0.001$). For every 1hr of SJL, BMI-z increases 0.389 units ($b = 0.00647$, $p = 0.016$). In children already overweight or obese, 1hr increase in SJL is associated with a 0.893 unit increase in BMI-z ($b = 0.0149$, $p < 0.001$).
Conclusion: Greater SJL was related to higher BMI-z in young children, consistent with findings in older children, adolescents, and adults. Thus, SJL may represent an obesity risk factor in early childhood. Targeted interventions to promote sleep regularity, especially in already overweight/obese children, may be beneficial. Future research should examine cumulative impacts of SJL across development and employ objective measures of body weight, including adiposity and waist circumference.
Support (if any): UH3-0D023313

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0201

EARLY POSTPARTUM MATERNAL STRESS AND MOTHER-INFANT BONDING PREDICTED INFANT NIGHTTIME WAKEFULNESS AT SIX MONTHS

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Introduction: Maternal stress levels, sleep, and mother-infant interactions are associated with infant sleep. However, the

potential impact of these factors experienced during the early postpartum period on future infant sleep development is understudied. This study examined whether maternal stress and sleep at 3 weeks postpartum predicted infant wakefulness at 6 months of age through mother-infant bonding and the home environment quality at 8 weeks postpartum.
Methods: This secondary analysis of the longitudinal Snuggle Bug/Acurrucadito cohort included a subsample of mothers (n=171, 31.4±5.4y, 74.9% married, 38% Hispanic/Latina, 64.3% ≥ bachelor's degree) and their full-term infants who were visited in their homes at 3 and 8 weeks, and 6 months postpartum. Infant wakefulness after sleep onset (WASO) was assessed using ankle-actigraphy and sleep diaries over 5 days at the 3-week and 6-month visits. At the 3-week visit, mothers completed the Pittsburgh Sleep Quality Index (PSQI, range:0-21) and the Stress subscale of the Depression Anxiety Stress Scales-21 (range:0-42). At 8 weeks, mothers completed the Postpartum Bonding Questionnaire infant-focused anxiety subscale (PBQ-anxiety, range:0-20, higher scores indicate greater anxiety-related bonding difficulties), and staff assessed the home environment quality with the Home Observation for Measurement of the Environment Inventory (HOME, range:0-45, higher scores indicate a more enriched and interactive environment). Based on the Transactional Model of Infant Sleep, path analyses were conducted to identify the direct effect of 3-week PSQI and Stress scores, and indirect effects via 8-week PBQ-anxiety and HOME scores, on 6-month WASO, adjusting for 3-week WASO, maternal age, education, and marital status.
Results: Average 3-week PSQI and Stress, and 8-week PBQ-anxiety and HOME scores were 6.8±3.1, 7.4±6.5, 2.1±1.9, and 36±4.5, respectively. WASO at 3 weeks and 6 months were 146.9±64.9 and 63.4±33.2min. The 3-week Stress score was not directly related to 6-month WASO (β=-0.28, 95%CI: -0.79-0.17), but positively related to 6-month WASO indirectly through 8-week PBQ-anxiety (β=0.14, 95%CI:0.02-0.31]). The 3-week PSQI was not directly or indirectly associated with 6-month WASO, and the HOME score was not a significant mediator.
Conclusion: Early, heightened maternal stress, independent of maternal sleep quality may indirectly lead to greater infant nighttime wakefulness later in infancy by disrupting early mother-infant bonding.
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0202

LATER SLEEP ONSET TIMING PREDICTS GREATER POSTPARTUM WEIGHT RETENTION AT ONE YEAR POSTPARTUM

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Introduction: Postpartum weight retention (PPWR), defined as ≥5kg difference between pre-pregnancy and 12-month postpartum weights, is associated with sustained weight retention across the life course. Maternal insufficient sleep duration is associated with PPWR. However, few studies have measured sleep objectively and other potentially relevant sleep dimensions. Moreover, little is known about these associations in the first month postpartum, the period with the greatest maternal sleep disruption. We investigated whether nocturnal total sleep time (TST), wake after sleep onset (WASO), and sleep onset time, predicted PPWR among mothers with full-term infants.
Methods: This study is a preliminary, secondary analysis of a subsample of mothers from the Snuggle Bug study (n=51, age M±SD= 32.2±5.2y, 35.3% Hispanic/Latina), a longitudinal cohort of mother-infant dyads with infants of normal birth weight. Sleep in mothers was measured using wrist-actigraphy and sleep logs over five days at three weeks postpartum. Pre-pregnancy weight and post-delivery weight were self-reported at three weeks postpartum and gestational weight gain (GWG) was computed. At 12 months postpartum, maternal weight was measured twice using an electronic digital scale (nearest 0.1kg), and breastfeeding duration was reported. Linear and binary logistic, multiple regression models examined the associations of each sleep metric with change in maternal weight (pre-pregnancy to 12-month postpartum) and PPWR status (≥5kg difference), respectively, adjusting for age, pre-pregnancy weight, GWG, and breastfeeding duration, and in the models with WASO and sleep onset, TST was added.
Results: At 3 weeks postpartum, mothers' mean TST, WASO, and sleep onset were 354.0±65.0min, 146.3±50.3min, and 23:19±1:23, respectively. The mean weight change from pre-pregnancy to 12 months postpartum was 3.0±6.8kg (5.0±8.7% increase from pre-pregnancy weight), and 34.0% had PPWR. Age and breastfeeding duration were not associated with the outcomes and were dropped from the models. Each one-hour delay in sleep onset predicted greater weight change (ΔR2=0.08, B=1.71kg, β=0.35, p=0.03), and greater odds of PPWR (OR: 1.90, 95%CI: 1.01-3.55, p=0.045). TST and WASO were not associated with the outcomes.
Conclusion: Among mothers, later bedtimes during early postpartum, independent of sleep duration, may heighten the risk for PPWR at one-year postpartum, which may have significant implications for cardiometabolic outcomes later in life.
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0203

ATTACHMENT STYLE AND MULTIDIMENSIONAL SLEEP HEALTH

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Introduction: Aspects of close relationships, including adult attachment style, are important for sleep health. While attachment anxiety has been consistently associated with poor sleep across the lifespan, studies linking attachment avoidance to poor sleep have been mixed. Some previous research has even suggested that attachment avoidance may be a protective factor for promoting better sleep. One limitation of these prior studies has been a reliance on a single measure of sleep. We addressed this limitation by examining associations between adult attachment style and a multidimensional measure of sleep health. We hypothesized that that both attachment anxiety and avoidance will be associated with poor self-reported multidimensional sleep health.
Methods: A community sample of midlife adults living in the deep south (N= 74; Mage = 52.67; SD=8.89; 76% Female, 78.7% White, 17.3% Black, 4% Other) were screened for sleep disorders, mental health conditions and physical illnesses. During a

baseline session participants completed a demographic measure, a self-report measure of multidimensional sleep health (created by summing scores on items assessing satisfaction, duration, regularity, alertness, efficiency and timing), and the Experiences in Close Relationships Revised Questionnaire, a self-report measure of adult attachment style.
Results: In correlation analyses, greater attachment avoidance was associated with poor multidimensional sleep health (r = -.269, p =.026). Attachment anxiety was not significantly associated with sleep health (r = -.144, p =.238). In follow-up multiple regression analyses, greater attachment avoidance was significantly associated with poor multidimensional sleep health above and beyond age, sex, race and body mass index (b = -.518, t= -2.25, p =.02, ΔR2 = .09). Including attachment anxiety in a regression model that included attachment avoidance and the above-mentioned covariates slightly attenuated the association between avoidant attachment and multidimensional sleep health effect (b=-.56, t = -1.925 p=.05, ΔR2 = .09).
Conclusion: These results are important because they offer new insight into understanding associations between adult attachment and sleep. Understanding associations between aspects of close relationships and sleep can help clarify potential interventions aimed at improving poor sleep health.
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0204

SPINDLE DETECTION IN POLYSOMNOGRAPHY OF TODDLERS: COMPARING MANUAL FEATURE DETECTION AND AN AUTOMATED ALGORITHM

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Introduction: Sleep spindles are a feature of NREM sleep distinctly related to memory (Friedrich et al., 2019; Kurdziel et al., 2013) and later outcomes (Jaramillo et al., 2023). They have a protracted developmental trajectory and, in toddlers, spindles are defined as 10-16 Hz sinusoidal waves with a minimum duration of 500 ms. Manual identification of spindles is time-intensive and subjective. A variety of automated algorithms, utilizing machine learning techniques, have been developed to combat this problem. However, these vary in the extent to which they are trained on robust datasets, accessible to researchers, and customizable. One option, meeting all three criteria, is the Yet Another Spindle Algorithm (YASA). YASA was trained on over 3,000 adult PSG records, is open-access and extensively documented, and is modifiable (Vallat & Walker, 2021). The goal of the current research was to examine the feasibility of YASA to detect spindles in a much younger population- toddlers. This requires direct assessment because spindles are qualitatively different in this age group.
Methods: Ten toddlers (Range = 21.07-23.5 months; M = 21.84 months) underwent overnight PSG. The first 30 minutes of artifact-free NREM was isolated and scored for sleep spindles. Spindles were identified manually by an expert sleep scorer and automatically via YASA. One adjustment was made to the YASA standard parameters, expanding the range of detectable spindles from 12-15Hz to 10-16Hz.
Results: Manual scoring served as the ground truth. YASA consistently detected fewer spindles than scorers (C3: Range_YASA = 0-6; M_YASA = 1.6 vs. Range_manual= 0-50; M_manual = 11.2). In one record, zero spindles were identified by both methods. Among the remaining records, the percent agreement, or total spindles identified by both methods out of the total identified by scorers, ranged from 0-44% (M = 8%, SD = 15%). False alarms were present in 3 records (Range = 1-5 spindles).
Conclusion: Results suggest YASA is not a reliable substitute for manual spindle detection in toddlers. However, additional modifications to the base code may be necessary. We will unpack these modifications and extend this analysis to other auto-detection approaches.
Support (if any): This research was funded by NIH R21 HD108913.

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0205

EXPLORING THE RELATIONSHIP BETWEEN SOCIAL JETLAG, SLEEP QUALITY, AND DEVELOPMENTAL OUTCOMES IN PRESCHOOLERS

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Introduction: Social jetlag (SJL), defined as the weekend-weekday discrepancy in the midpoint of the nocturnal sleep episode, is indicative of circadian misalignment. In adolescents, SJL is associated with poor sleep quality and impaired daytime and academic functioning. However, data on the prevalence and impact of SJL in preschoolers is limited. The present study examines the prevalence of SJL in preschoolers and its association with sleep, sleepiness, and developmental outcomes.
Methods: Data consisted of a cross-sectional sample of 841 children aged 2-5 years (M = 3.6 years, 50.3% female, 27.7% Black) in Mississippi between 2001-2003. Parents completed a questionnaire about child demographics, sleep habits, and developmental history. In a sub-sample of preschoolers, linear regression was used to examine the relationship between SJL and (i) measures of sleep quality (Children's Sleep Wake Scale (CSWS)); (ii) daytime sleepiness (propensity to fall asleep), (iii) school readiness (Bracken School Readiness Assessment (BSRA)), and (iv) social skills (Social Skills Rating System (SSRS)).
Results: Following exploratory analysis, the prevalence of SJL within the sample was categorized as: no SJL (25.1%), < 90 mins of SJL (58.6%), and >90 mins of SJL (13.6%). Compared to no SJL and < 90 mins of SJL, >90 mins of SJL was associated with greater problems "going to bed" (R^2 = 0.012, F = 3.5, p = 0.031) and "returning to wakefulness" (R^2 = 0.092, F = 21.0, p < 0.001) on the CSWS. Additionally, >90 mins of SJL was associated with greater daytime sleepiness (R^2 = 0.097, F = 22.0, p < 0.001), relatively lower school readiness (R^2 = 0.075, F = 4.1, p = 0.020), and poorer social skills (R^2 = 0.054, F = 8.2, p < 0.001).
Conclusion: Social jetlag is highly prevalent among preschool children. Greater than 90 mins of SJL may be a risk factor for impaired daytime functioning and poor developmental outcomes. Future research is needed to identify moderators and mediators of these relationships. These findings could inform health intervention programs targeting sleep in early childhood.
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0206

THE FAMILY ENVIRONMENT: A POTENTIAL DRIVER IN CHILDREN'S SCHOOL-SUMMER SLEEP DIFFERENCES

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Introduction: More than 1/3 of US children do not sleep adequately. Our previous work has shown that during summer, 5-8-year-old children go to bed later, obtain less sleep, have a lower Entrainment Sleep Regularity Index (ESRI), and have lower sleep efficiency compared to the school year. Good sleep hygiene helps support adequate sleep. We hypothesized that school year-summer differences in the family environment would explain differences in children's sleep timing, efficiency, and ESRI.
Methods: 119 parents of 5-8-year-olds completed measures of child temperament, sleep hygiene, and parenting practices. Child sleep was measured for 8 days using wrist actigraphs in the summer and school year. Sleep timing was determined using the Sadeh algorithm and sleep diaries. Paired samples t-tests examined school year-summer differences in family variables. Multivariate analyses were performed to calculate predictors of sleep midpoint, total sleep time, sleep efficiency, and ESRI.
Results: Compared to the school year, during summer parents reported less consistent bedtime routines ($t(108)=3.388$, $p<.001$), increased average daily screen use ($t(107)=-3.194$, $p=.001$), less parent-child sleep conflict ($t(108)=3.388$, $p<.001$) and greater child surgency (impulsivity) ($t(108)=-2.960$, $p=.004$). During the school year, chronotype ($\beta=3.639$, $p<.001$), greater sleep reinforcement ($\beta=-2.005$, $p=.041$), greater caffeine use ($\beta=5.312$, $p=.02$), lower negative affect ($\beta=-10.156$, $p=.039$), and greater effortful control ($\beta=14.253$, $p=.014$) predicted later sleep midpoint. Greater bedtime routine consistency predicted lower sleep efficiency ($\beta=-0.154$, $p=.032$). During the summer, chronotype ($\beta=5.542$, $p<.001$) and decreased bedtime routine consistency predicted later sleep midpoints ($\beta=-2.438$, $p=.016$). Greater maladaptive bedtime activities ($\beta=-.009$, $p=.004$), greater sleep reinforcement ($\beta=-.007$, $p=.036$), and greater screen media use ($\beta=-.003$, $p=.019$) predicted lower ESRI.
Conclusion: Concerningly, maladaptive bedtime behaviors and screen media use predicted lower ESRI during the summer, which has been associated with increases in children's BMI over the summer. Overall, these results suggest factors that contribute to unhealthy sleep habits differ during the school year and summer. During the school year, it may be important to encourage families to limit caffeine while during summer, promoting consistent bedtime routines and limiting screen media may help improve children's sleep, with potential BMI effects.
Support (if any): Texas Children's Pediatric Pilot Award

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0207

NREM SLEEP OSCILLATIONS AND THEIR RELATIONS TO MOOD SYMPTOMS IN CHILDREN WITH ANXIETY DISORDERS

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Introduction: Sleep disturbances are common in children and adolescents with anxiety disorders. NREM sleep oscillations have been associated with affect and emotional wellbeing and undergo drastic maturational changes during puberty. The primary objective of the current study was to quantify NREM microstructure in children with anxiety disorders (Generalized Anxiety Disorder, Separation Anxiety Disorder or Social Anxiety Disorder) and examine their relations with severity of mood symptoms.
Methods: Forty-two participants (9-13 years, mean age: 11.33 years, n(anxiety)=16, n(comparison)=26) completed an in-lab overnight polysomnography session (with a 32-channel EEG acquisition device). Sleep spindles and slow oscillations during N2 and N3 sleep were detected with a validated wavelet-based algorithm and characterized using custom scripts. Symptom severity was measured based on parent reports on Child Behavior Checklist (CBCL) and Revised Children's Anxiety and Depression Scale (RCADS). Regressions between symptoms and NREM oscillation characteristics were based on 3 representative electrodes (Cz, Fz, Pz)
Results: Spindle duration was significantly reduced in children with anxiety (7 electrodes, $tsum=-17.04$, $pcorrected=0.04$). In the entire sample, spindle duration was associated with severity of depression such that shorter spindle duration correlated significantly with higher depressive symptoms (frontal: $p<.001$, central: $p=.03$, parietal: $p=.02$). We didn't observe any other differences in NREM oscillation characteristics. There were no group differences in sleep duration, quality or architecture.
Conclusion: In a sample of mostly prepubertal children with anxiety disorders, we observed a reduction in spindle duration compared to a demographically matched group of typically developing children. This finding was in the context of normal sleep duration, quality and architecture. Reduced spindle duration was associated with heightened depressive symptoms. Spindle duration has been associated with general cognitive ability and has been shown to decrease linearly with age during adolescence. A recent study on older adolescents at clinical high risk for psychotic disorders also reveals a significant reduction in spindle duration. These findings suggest that alterations in spindle duration may be a marker of general psychopathology in adolescence. Our future plans include repeating sleep monitoring longitudinally in these participants to trace the developmental trajectory of NREM oscillations across different stages of puberty.
Support (if any): Iowa Neuroscience Institute Pilot Grant (Ideas Lab)

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0208

SLEEP IRREGULARITY PREDICTS EMOTIONAL CHANGE AFTER SLEEP RESTRICTION AMONG SCHOOL-AGED CHILDREN

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Introduction: Sleep irregularity has been associated with more negative emotional outcomes in adolescents and young adults. Although commonly used, standard deviation of sleep duration may be a less sensitive metric of sleep regularity in school-aged children given increased need for sleep and parental influence on sleep timing during childhood. We therefore examined another metric of sleep regularity, mean sum of successive differences (MSSD), in association with children's responses to emotional stimuli when rested and after partial sleep restriction.

Methods: Healthy children (N = 50, 7-11 years, M age = 9.65; 56% female) wore actigraphs for one week from which MSSD of sleep time (TST) and midsleep point (MSP) was calculated. Both after a night of full sleep and after two night of sleep restriction (SR; 7 and 6 hours sleep), participants were asked to suppress their facial expressions in response to negatively valanced movies while respiratory sinus arrythmia (RSA), a measure of physiological emotional regulation, was monitored. Participants also rated difficulty of emotional suppression (ES). Hierarchical linear regressions were run with change in RSA during negative movies and difficulty of ES while rested and after SR as dependent variables, and regularity metrics as independent variables. Average TST and pubertal status were entered as covariates, as well as resting RSA and change in resting RSA after SR in relevant models.
Results: Sleep regularity did not predict emotional variables when children were rested. However, greater TST MSSD (β=0.26, p=0.02) predicted increased RSA during movies after SR, suggesting greater difficulty regulating emotional responses (overall model: F(4,28)=3.12, p=0.03, addition of TST MSSD: ΔR2 = 0.15, F(1,28)=6.21, p=0.02). Additionally, greater MSP MSSD (β=-0.9, p=0.0003) predicted less ES difficulty post SR, indicative of blunted affective expression (overall model: F(3,46)=6.22, p=0.001, addition of MSP MSSD: ΔR2=0.24, F(1,46)=15.27, p=0.0003).
Conclusion: Irregularity in TST may exert the greatest impacts on school-aged children's physiological emotional responses when sleep duration is inadequate. Analyses also suggest a blunting effect of irregular sleep timing on emotional expression after inadequate sleep duration. Our findings warrant further exploration.
Support (if any): Data collection was supported by grant #R21MH099351

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0209

A SLEEPERY SLOPE: INHIBITORY CONTROL IN CHILD-ADOLESCENT TRANSITION LINKED TO POWER-LAW SCALING IN NREM SLEEP EEG

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Introduction: Structural changes emblematic of brain development, e.g., synaptic pruning/myelination, are theorized to impact sleep architecture, local sleep physiology, and sleep-dependent cognition. Conventional analyses of sleep in development, relying on absolute or relative power from electroencephalography (EEG) to study the function of sleep rhythms, have disregarded the 1/f EEG power law as "neural noise". However, evidence tying steepness (1/f exponent) and intercept (1/f offset) of the power law curve to excitatory-inhibitory (E/I) balance and asynchronous neuronal population spiking warrants a reexamination of developmental sleep EEG.
Methods: 19 healthy children and adolescents (ages 11-17, 11 girls) underwent overnight polysomnography with 128 channel EEG. Inhibitory control was assessed following sleep using inhibition scaled score (ISS) on a Color Word Interference Test. Spectral parameterization (fooof) was applied to median NREM multitaper absolute spectra (0.5-40Hz) to extricate oscillatory from aperiodic features (1/f exponent, 1/f offset, and residual oscillatory power). Topographical correlations between parameterized spectra, age and ISS were obtained with 5000-permutation threshold free cluster enhancement. Bootstrapped multiple regressions adjusting for age and sex modeled the association between ISS and parameterized neural spectra.
Results: Age showed widespread negative topographical correlations with broadband absolute spectral power, but these effects vanished in correlations with all oscillatory residuals except slow sigma (11-13Hz), which showed a modest negative trend over a central cluster. Remarkably, age showed widespread negative associations with 1/f offset, while age and 1/f exponent showed a negative trend over central channels. ISS was not significantly correlated with absolute power or with oscillatory residuals in canonical bands but was strongly negatively associated with 1/f exponent in a bilateral parietal arc. The cluster average of exponents from this parietal association significantly predicted next day ISS performance, adjusting for age and sex (B = 0.803, p = 0.013).
Conclusion: Aperiodic rather than oscillatory activity may drive broadband changes in developmental NREM spectra , and parietal E/I balance during sleep may partially explain (independent of age) developmental inhibitory control during wakefulness. More broadly, aperiodic features may complement neural oscillations in balancing localized and systemwide information processing demands to support developmental cognition.
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0210

CHRONOTYPE, SLEEP DIFFICULTIES AND LIFESTYLE HABITS IN ADOLESCENT ATHLETES DURING THE COVID-19 PANDEMIC

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Introduction: It is increasingly known that elite athletes have a high prevalence of sleep difficulties and that chronotype may influence this relationship. Although adolescents are also at risk for sleep disturbances, including a phase delay, few studies have characterized the sleep of adolescent athletes. The aim of this study was to investigate sleep difficulties and lifestyle habits in young athletes of different chronotypes.
Methods: 208 young elite athletes (M=14.9y) completed the following online questionnaires during the first wave of the pandemic: Pittsburgh Sleep Quality Index (PSQI), Insomnia Severity Index (ISI), and homemade questions on electronic and caffeine usage. Training quantity during, and before the pandemic (retrospectively) was also assessed. One-way ANOVAs were computed with chronotypes on 1) sleep duration and 2) social jetlag calculated from the PSQI, 3) PSQI total score, 4) ISI total score, 5) average number of time they use electronic during the hour before bedtime/week, and 6) average number of caffeinate product consume/day. A repeated measures ANOVA was also computed with the chronotypes on the training quantity before and during the pandemic.

Results: Results reveal significant differences between chronotypes in sleep duration (F[2,206]=20.12, p<.001), social jetlag (F[2,206]=6.77, p=.001), PSQI total score (F[2,206]=9.73, p<.001), and ISI total score (F[2,206]=11.19, p<.001). Post-hoc analyses show that in all cases, evening types had significantly more sleep disturbances than neutral types and morning types, while they were no differences between neutral and morning types. The same pattern was also found in usage of electronic devices less than an hour before bed (F[2,206]=10.04, p<.001), where evening types used electronic devices before bed significantly more than neutral types and morning types. No differences were found between neutral and morning types. No differences were found in caffeine usage (p=.06). Finally, results show that athletes of all chronotypes significantly reduced their amount of training hours during the pandemic (F[2,206]=123.47, p<.001).
Conclusion: This study raises important questions about challenges associated with sleep difficulties and evening chronotypes in young athletes. Given the very early onset of these difficulties, the implementation of prevention strategies and sleep hygiene awareness programs in young adolescents should be included and prioritized in national athlete development programs.
Support (if any):

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0211

THE INTERSECTION OF SLEEP, PAIN, AND EXECUTIVE FUNCTION IN GIRLS FOLLOWING THE MENARCHEAL TRANSITION

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Introduction: Adolescence is marked by shifts in sleep, both in terms of timing and quality. Little is known about how these disruptions in sleep relate to pain and executive functioning (EF) following the onset of menstruation (e.g., menarche) in females. This study examines the relations between 1) sleep disturbances and pain, 2) sleep disturbances and EF, and 3) pain and EF in a sample of adolescents who experienced menarche in the past year.
Methods: A community sample of biological females (n = 159; M age = 12.8; SD age = 1.1; 74% white) and their caregivers were recruited from a Midwestern metropolitan area. Caregivers reported on demographics, sleep disturbance (PROMIS Sleep Disturbance Short Form), and EF problems (BRIEF scales: Inhibitory Control (IC), Emotion Control (EC), Shift (S), Working Memory (WM), and Task Switching (TS) subscales). Adolescents reported on somatic symptoms (Children's Somatic Symptom Inventory: CSSI) and period pain ("Over the last three months, what was the average cramping pain you experienced with your period?"; rating scale 0 [no pain] to 10 [worst pain imaginable]).
Results: A series of linear regressions investigated the relation between sleep, pain, and EF. Participants with higher somatic symptoms, but not greater period pain, experienced more sleep disturbance (β =.098, p=.032). More sleep disturbance was associated with more EF problems including EC (β = .016, p<.001), S (β =.169, p<.001), WM (β = .136, p=.01), and TS (β = .169, p<.001). There were no significant associations between either somatic symptoms or period pain and EF problems. Thus, adolescents who experienced more sleep disturbance exhibited higher levels of somatic symptoms and more difficulty with emotional regulation, cognitive flexibility, and memory.
Conclusion: Preliminary results indicate that sleep disturbance in the year following menarche is related to more somatic symptoms, but not more period pain. Further, sleep disturbance appears to be closely linked to EF problems. Data collection is ongoing, and actigraphy data on sleep (duration, quality) will be used to further investigate how sleep relates to pain and EF during this important developmental transition.
Support (if any):

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0212

ASSOCIATIONS BETWEEN SLEEP EEG AND REPORT CARD GRADES IN MATHEMATICS IN ADOLESCENTS

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Introduction: Academic success plays an important role in improving future lifetime opportunities. Numerous factors have been identified as being relevant to academic achievement, but the role played by sleep in this process has been largely under studied. Accumulating evidence indicates that healthy sleep has beneficial effects on academic success, but the brain mechanisms underlying the interplay between sleep and academic outcomes in adolescents are poorly understood. Sleep electroencephalogram (EEG) is tightly linked to structural and functional features of the central nervous system. EEG signals during NREM and REM sleep have been validated to be excellent noninvasive correlates of adolescents' brain maturation. However, previous studies examining the associations between sleep and academic achievement were based on primarily subjective measures of sleep or actigraphy. Thus, it is not known if or how these associations are related to adolescents' brain activity during the night. The objective of this study was to examine the association between sleep EEG and report card marks in Mathematics in healthy adolescents.
Methods: Sample of 40 adolescents (26 girls, 18 boys) between the ages of 12 to 15 years (M= 13.9; SD = 0.95) participated in the study. Sleep EEG was recorded using a single night of ambulatory sleep EEG monitoring with frontal derivations during the school week in the child's home. The Sleep Profiler was used to evaluate sleep EEG through the measurement of ambulatory EEG recorded from three frontal sensors placed at approximately F7, F8 and Fpz; Automated sleep/wake scoring was performed using the Sleep Profiler system followed by visual analysis by an experienced pediatric sleep specialist. Report card grades were used to assess adolescents' academic achievement in Mathematics for the current semester.
Results: Multiple linear regression analyses revealed that longer duration of N3 sleep was significantly associated with higher marks in Mathematics, above and beyond the contributions of age, gender, socioeconomic status and PSG-measured sleep duration.
Conclusion: Our findings suggest that longer duration of N3 sleep recorded in the home environment in healthy adolescents is positively associated with better grades in Mathematics.

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0213

LATENT TYPOLOGIES OF COLLEGE STUDENTS' SLEEP-RELATED HABITS AND BEHAVIORS

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Introduction: With 43% of college students obtaining less than the recommended 7-9 hours of sleep per night and with over 75% reporting feeling tired/sleepy most days of the week (American College Health Association, 2023), this population is at significant risk for mental health, physical, and academic problems (Gaultney, 2010; Peltz & Rogge, 2016). Research has tended to focus on links between deficient sleep and negative outcomes via variable-center approaches (e.g., linear modeling), which may fail to capture individuals who exhibit multivariate sleep patterns (Yue et al., 2022). The present study used a latent profile analysis to identify subpopulations based on an extensive group of sleep-related habits and behaviors endorsed by a large sample of college students.
Methods: The current sample's mean age (N=638, 82.4% female) was 21.3 years (SD=2.4; range 18-34), and 64.3% of participants were white, with 19.6% Asian/Pacific Islander, 6.9% Black, 6.7% Hispanic/Latinx, and 2.5% multi-racial or "other." Approximately 60.5% of the sample lived on campus, and 56.8% maintained part- or full-time employment while attending school. The sleep-related habits and behaviors included in the latent profile analysis included the following scales: sleep disturbance, daytime impairment, environmental noise, sleep environment, sleep competency, sleep hygiene, work hours, problematic smartphone use, chronotype, and melatonin usage.
Results: Five sleep classes were identified including two more adaptive groups (great sleepers-23% & typical sleepers-35%), and three groups reporting greater sleep challenges (poor but conscientious sleepers-19%, poor sleepers-20%, & self-sabotaging sleepers-3%). The two adaptive groups reported fewer depressive/anxiety symptoms and higher GPAs, whereas the groups reporting disrupted sleep reported greater depressive/anxiety symptoms, life stress, and lower GPAs. The poor but conscientious sleepers were distinguished by better sleep environments and sleep hygiene (with slightly lower impairment), whereas the sabotaged sleepers were distinguished by poorer sleep hygiene, sleep environments, and greater problematic phone and alcohol use (with slightly greater impairment). Regressions predicting individual, interpersonal, and adaptive functioning highlighted that the typologies contributed unique predictive validity toward understanding college student functioning.
Conclusion: Our results highlight the diversity of sleep typologies present in college students. Students falling into poor/problematic sleep groups remain at risk for negative psychosocial and other health-related outcomes.
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0214

PRE- AND POST-PANDEMIC ADOLESCENT PHYSICAL ACTIVITY AND POTENTIAL IMPACTS ON SLEEP

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Introduction: Research suggests that up to 70% of U.S. adolescents get less than 8 hours of sleep per night regularly and less than 25% of children ages 6-17 years old meet the CDC recommendation of 60 minutes of daily physical activity. We hypothesize that decreased physical activity was associated with worse sleep among adolescents across 2017 to 2021, and that the magnitude of the association may have changed during and after the COVID-19 pandemic.
Methods: We utilized the Youth Risk Behavior Surveillance System (YRBS) for our analyses. All participants of the 2017, 2019, and 2021 national YRBS surveys were eligible for inclusion. The main outcome of interest was school-night sleep duration (ordinal variable: <= 5 hours, 6-7 hours, 8+ hours), and the primary predictor was days per week of 60+ minutes of moderate to vigorous physical activity. We conducted survey weighted ordinal logistic regressions to explore the association between physical activity and sleep.
Results: The analytic sample included 38,531 adolescents; ages 12 to 18 years old. Across all three years of the data, each additional day of physical activity was associated with a similar increase in the odds of receiving more sleep: in 2021 OR = 1.11 95%CI 1.08 – 1.15, in 2019: 1.09, 95%CI 1.07 – 1.12, and in 2017: 1.08 95%CI 1.05 – 1.11.
Conclusion: As hypothesized, increased physical activity was significantly associated with increased sleep. Although the effect size increased somewhat across the three years sequentially, this change was not statistically significant. 2023 YRBSS data will be available in January 2024. We plan to run additional analyses to expand on initial findings at that time, in addition to identifying potential effect modifiers of the relationship.
Support (if any):

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0215

OPTOGENETIC RESCUE OF SLEEP SLOWS ALZHEIMER'S PROGRESSION IN A MOUSE MODEL

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Introduction: Alzheimer's disease (AD) patients exhibit memory disruptions and sleep disturbances, such as disruption of deep non-rapid eye movement (NREM) sleep. Slow-wave activity (SWA) is a restorative feature of NREM sleep and is important for memory consolidation.
Methods: We made a mouse model where GABAergic interneurons could be targeted in the presence of APPswe/PS1dE9 (APP) amyloidosis, APP-GAD-Cre mice. An electroencephalography (EEG) / electromyography (EMG) telemetry system was used to monitor sleep disruptions in these animals. Optogenetic stimulation of GABAergic interneurons in the anterior cortex targeted with channelrhodopsin-2 (ChR2) allowed us to examine examining the role GABAergic interneurons play in sleep deficits. We also examined the effect of optogenetic stimulation on amyloid plaques, neuronal calcium as well as sleep-dependent memory consolidation. In addition, microglial morphological features and functions were assessed using confocal microscopy and flow cytometry. Finally, we performed sleep deprivation during optogenetic stimulation to investigate whether sleep restoration was necessary to slow AD progression.
Results: APP-GAD-Cre mice exhibited impairments in sleep architecture including decreased time spent in NREM sleep, decreased delta power, and increased sleep fragmentation compared to nontransgenic (NTG) NTG-GAD-Cre mice.

Optogenetic stimulation of cortical GABAergic interneurons increased SWA and rescued sleep impairments in APP-GAD-Cre animals. Furthermore, it slowed AD progression by reducing amyloid deposition, normalizing neuronal calcium homeostasis, and improving memory function. These changes were accompanied by increased numbers and a morphological transformation of microglia, elevated phagocytic marker expression, and enhanced amyloid β (Aβ) phagocytic activity of microglia. Sleep was necessary for amelioration of pathophysiological phenotypes in APP-GAD-Cre mice.
Conclusion: In summary, our study shows that optogenetic targeting of GABAergic interneurons rescues sleep, which then ameliorates neuropathological as well as behavioral deficits by increasing clearance of Aβ by microglia in an AD mouse model.
Support (if any): NIH, BrightFocus Foundation, Alzheimer's Association

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0216

BEHAVIORAL STATE RECORDING & SLEEP DEPRIVATION IN MICE TO EXPLORE THE UNDERLYING MECHANISMS OF ALZHEIMER'S DISEASE

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Introduction: Alzheimer's disease (AD), the most common form of dementia in the US, affecting 6.5 million individuals with a total healthcare cost of $321 billion, is characterized by cognitive dysfunction, memory problems, and disrupted sleep. Mice are crucial for studying AD and sleep patterns in humans, but current methods for inducing sleep disruption have limitations such as wired telemetry, real-time monitoring challenges, and disrupting the mouse's home environment. Better tools are needed to maximize the potential of mouse models in AD and sleep research. Objectives: This study aims to fill this gap by developing a novel system of sleep deprivation in mice to explore the underlying mechanisms connecting sleep and AD.
Methods: This study utilized a combination of DSI Co. wireless telemetry, Spike-2 software from CED Co., and third-party olfactory controllers to achieve automatic sleep deprivation via air-puffs. C57BL/6J (B6) mice were utilized for validation of the behavioral state recording/sleep deprivation system and preliminary biological analyses. The system was employed to achieve sleep deprivation in mice for 9 hours, then blood and brain tissue were collected for subsequent genetic analysis. qPCR was then applied to determine the expression of genes of interest related to AD, which was utilized in combination with analysis of variance to elucidate significance.
Results: Behavioral state recordings indicate the system can accurately collect and analyze telemetry signals in real time then initiate an air-puff, which successfully wakes the animal. qPCR results indicate a significant decrease in DNA damage repair enzyme and an increase in inflammatory cytokine gene expression, relative to controls, following ~9 hours of sleep deprivation ($p < 0.05$). These results collectively indicate the progression of an AD-phenotype.
Conclusion: These preliminary results indicate this novel system of behavioral state recording and sleep deprivation in mice can be applied to successfully explore the underlying mechanisms connecting sleep and AD. Future studies will extend to further proteomic and epigenetic analyses and explore specific sleep stages in relation to AD-progression.
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0217

AMONG OLDER ADULTS, SEX MODULATES THE APOE GENOTYPE EFFECTS ON SLEEP AND SLEEP-DEPENDENT MEMORY CONSOLIDATION

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Introduction: Alzheimer's disease (AD) is a world-wide healthcare crisis among older adults. Sex, aging, and apolipoprotein E (APOE) genotype are among the most impactful risk factors for AD. Sleep is beneficial for memory and changes with age. We aimed to test whether sex and APOE (ε4-carriers/non-carriers) interact to impact sleep-dependent memory consolidation (SDMC).
Methods: We tested 67 older adults (41 women, 25 ε4-carriers, mean±SD; 61.8±6.1 years). Participants encoded word-pairs in the evening, were tested immediately, then underwent overnight in-lab polysomnography, and performed a delayed test in the morning. SDMC was computed as a difference score (morning-evening). Time spent in non-rapid eye movement (NREM) sleep stages, and electroencephalography (EEG) spectral power in frontal canonical frequency bands during NREM sleep, were quantified. ANOVA, independent t-tests, and bivariate correlation analyses were employed in the study.
Results: A sex×APOE interaction predicted SDMC ($p=0.02$). Post hoc analysis revealed no difference between male ε4-carriers and non-carriers ($p=0.36$), but among women, ε4-non-carriers exhibited increased deterioration (more forgetting) compared to ε4-carriers ($p=0.02$). Additionally, male ε4-carriers had worse memory retention than female ε4-carriers ($p=0.01$). Further analysis showed that female ε4-carriers spent more time in N3 sleep ($p=0.01$), correlating with better SDMC ($r=0.72$, $p=0.02$), while male ε4-carriers spent more time in N2 sleep ($p=0.04$), also linked to better SDMC ($r=0.68$, $p=0.03$). Regardless of sex, among ε4 non-carriers, no significant associations were found between theta, alpha, slow-sigma, fast-sigma during NREM sleep and memory (all ps>0.17). Among ε4-carriers, male participants showed no significant associations (all ps>0.54), whereas females exhibited positive associations between memory and theta ($r=0.80$, $p=0.005$), alpha ($r=0.82$, $p=0.004$), slow-sigma ($r=0.85$, $p=0.002$), and fast-sigma ($r=0.77$, $p=0.009$).

Conclusion: Our study reveals that the interplay of sex and APOE affects sleep patterns and memory consolidation in older adults. Notably, distinct NREM sleep stages impact SDMC differently in male and female APOE ε4-carriers. While enhanced sleep quality may mitigate APOE and sex-related cognitive decline in later life, considering sex-related differences in memory benefits from sleep is crucial for older adults at high risk for AD.

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0218

SLEEP AND CIRCADIAN POLYGENIC RISK SCORES PREDICT ACTIGRAPHY-DERIVED TRAITS AND COGNITION IN OLDER ADULTS

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Introduction: Sleep disturbances are prevalent in older adults and have been associated with major pathophysiological characteristics of Alzheimer's disease. Genome-wide association studies (GWAS) of sleep and circadian traits identified hundreds of genetic loci influencing variability in these phenotypes. GWAS summary statistics can be used to derive polygenic risks scores (PRS), a quantitative measure of genetic risk for a particular phenotype. In this study, we assessed whether sleep and circadian PRS can predict actigraphy-derived measures and cognition scores among older adults followed at the University of Kansas Alzheimer's Disease Research Center.

Methods: We collected 7-days of actigraphy and cognitive assessments of verbal memory, attention, and executive function among participants of European ancestry with genome-wide genotyping data. Linkage disequilibrium reference panels and GWAS summary statistics for insomnia, chronotype, and sleep duration were used to calculate PRS using a Bayesian regression approach with continuous shrinkage priors (PRS-CS). We used Spearman correlations and general linear models adjusted for age, sex, and education to test for associations of PRS with actigraphy-derived traits (sleep duration, sleep efficiency, wake after sleep onset [WASO], number of awakenings, and sleep midpoint) and cognitive factors.

Results: The final dataset consisted of 61 participants (mean [standard deviation (SD)] age 74.1 [6.5] years; 39.3% female; mean 16 [3] years of education). No associations were observed between early chronotype PRS and early sleep midpoint, nor sleep duration PRS and objective sleep duration. However, early chronotype PRS was negatively correlated with WASO (ρ=-0.32; p=0.012) and positively correlated sleep efficiency (ρ=0.30; p=0.018). Adjusted analyses suggest that a one SD increase in early chronotype PRS was associated with lower WASO (β[95%CI]=-15.0[-29.3;-0.76] minutes; p=0.043) and higher sleep efficiency (2.9[0.6;5.1] %; p=0.014). Furthermore, one SD increase in sleep duration PRS was associated with better performance on attention (2.9 [0.6;5.1] SD; p=0.009). No significant associations with insomnia PRS were observed.

Conclusion: This study identified novel associations between early chronotype and sleep duration PRS and relevant actigraphy-derived traits and attention in a clinical cohort of older adults. Results may inform the potential role of genetically informed sleep traits towards understanding their impact on cognition.

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0219

SLEEP DISTURBANCES, CORTISOL, AND NEUROIMAGING CORRELATES AMONG MEMORY CLINIC PATIENTS

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Introduction: Several sleep disturbance parameters as well as abnormal cortisol secretion levels are increasingly acknowledged as risk factors for Alzheimer's disease (AD). Currently, the mechanisms between sleep disturbances and AD, and the interplay with abnormal cortisol levels, are still not understood. This study examines how self-reported sleep disturbances are associated with structural brain measures and diurnal cortisol dysregulation in a cohort of memory clinic patients.

Methods: The study was based on a cohort of 146 memory clinic patients diagnosed with either mild cognitive impairment or subjective cognitive impairment. The Karolinska Sleep Questionnaire (KSQ) was used to measure self-reported sleep. Neuroimaging (MRI or CT) was used to quantify structural brain measures using four visual rating scales (Scheltens, Pasquier, Koedam, and Fazekas scales). Salivary cortisol was sampled to measure diurnal cortisol patterns through five computed measures of awakening, bedtime, total, AM/PM cortisol ratio, and cortisol awakening response.

Results: Some associations were found between sleep, structural brain measures and cortisol. Increased apnea index (based on the KSQ) was associated with greater odds of posterior brain atrophy (OR=1.20, p=0.015) measured by the Koedam visual rating scale. Further, increased apnea index was associated with reduced awakening cortisol (β=-0.03; p=0.045, and an increased daytime sleepiness index (based on the KSQ) was associated with both reduced awakening cortisol (β=-0.03; p=0.025) and a reduced AM/PM cortisol ratio (β=-0.04; p=0.021).

Conclusion: In a memory clinic cohort, self-reported apnea disturbances are associated with a neuroimaging correlate of increased posterior atrophy and lower awakening cortisol, while daytime sleepiness index is associated with lower awakening cortisol and a reduced AM/PM cortisol ratio. These findings add insights into the early identification of modifiable AD risk factors an¬d their mechanisms.

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0220

CIRCADIAN RHYTHMS AND RESTING STATE FUNCTIONAL CONNECTIVITY OF THE HIPPOCAMPUS IN LATER LIFE ADULTS

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Introduction: Functional decline in the hippocampus is a prominent neurodegenerative feature of Alzheimer's Disease and related dementias. Alterations in circadian rhythms can exacerbate cognitive aging and neurodegeneration. This study examined how dim light melatonin onset (DLMO) is associated with resting state functional connectivity of the hippocampus and three cortical regions (i.e., prefrontal, temporal, and posterior cingulate).

Methods: We studied data from 52 later-life adults (mean age =70.0 SD= 6.3). T1-weighted anatomical images and resting-state Blood Oxygenation Level Dependent (BOLD) images from 3.0T MRI data were collected. DLMO information was also collected from participants and was used to determine circadian timing. We then assessed the relationship between circadian timing and resting state functional connectivity of the hippocampus to the three cortical regions. Multiple linear regression modeling with hippocampal connectivity as the dependent variable was used to analyze the data while controlling for age and sex.

Results: The findings of this study indicated that later DLMO time was associated with greater functional connectivity between the hippocampus and prefrontal cortex (b = 0.04, p = .016), and hippocampus and temporal (b = 0.05, p = .006) cortices. However, DLMO was not associated with the functional connectivity of the hippocampus and posterior cingulate cortex.

Conclusion: The findings suggest that later circadian timing (DLMO) is related to increased hippocampal connectivity to the prefrontal and temporal cortices in later-life adults. This indicates that earlier DLMO may be associated with a greater risk for hippocampal-related cognitive aging. Future studies using larger sample sizes, multimodal neuroimaging techniques, and longitudinal designs are needed to understand the relationships better.

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0221

EFFECT OF ACUTELY INDUCED OSA DURING SWS ON AD PLASMA BIOMARKERS

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Introduction: OSA induces both sleep fragmentation and intermittent hypoxemia and has been associated with AD progression. We hypothesized that SWS-specific OSA can influence plasma AD biomarkers.

Methods: We developed a model of SWS-specific CPAP-withdrawal in subjects with AHI4% ≥ 20/hour to create 3 polysomnologically (PSG)-verified conditions per subject: 1) stable-SWS on CPAP, 2) SWS-fragmentation with intermittent hypoxemia (OSAsws), and 3) SWS-fragmentation with reduced hypoxemia (OSAsws+O2). We examined post-PSG morning plasma Aβ42 and Aβ40 by mass-spectrometry and plasma T-tau, P-tau181, NfL and GFAP by SIMOA in a study of 34 patients. Wilcoxon signed rank and Kruskal Wallace tests were used to compare SWS-specific OSA metrics and plasma measures across PSG conditions.

Results: In 34 patients (57 years, 32% female) CPAP withdrawal caused sleep disruption and recurrence of underlying OSA such that the OSAsws and OSAsws+O2 conditions caused significant increases in AHI4 and arousals during SWS [CPAP: 0 ±0, OSAsws: 16.1 ±15.7, OSAsws+O2: 16.2 ±12.0 in evts/hr, p< 0.0001], and arousal index during SWS [CPAP: 0.9 ±2.0, OSAsws: 11.7 ±14.3, OSAsws+O2: 11.7 ±15.5 in evts/hr, p< 0.0001] compared to CPAP treatment. Furthermore, the minimum SpO2 desaturation level of OSAsws was lower than OSAsws+O2 (OSAsws: 89.9 ±4.0, OSAsws+O2: 90.1 ±5.9 in % SpO2, p= 0.007). No change was observed between PSG conditions in Aβ42 (CPAP: 22.9 ±6.2, OSAsws: 21.3 ±6.2, OSAsws+O2: 21.2 ±6.8 in pg/mL), Aβ40 (CPAP: 232.3 ±39.9, OSAsws: 233.2 ±89.6, OSAsws+O2: 197.7 ±114.6), the ratio of Aβ42 to Aβ40 (CPAP: 0.10 ±0.01, OSAsws: 0.10 ±0.02, OSAsws+O2: 0.10 ±0.01), T-tau (CPAP: 3.1 ±0.3, OSAsws: 3.3 ±1.1, OSAsws+O2: 2.9 ±0.8 in pg/mL), P-tau181 (CPAP: 1.4 ±1.0, OSAsws: 1.5 ±0.5, OSAsws+O2: 1.6 ±0.9 in pg/mL), NfL (CPAP: 8.7 ±4.4, OSAsws: 6.0 ±3.0, OSAsws+O2: 7.8 ±6.0 in pg/mL), and GFAP (CPAP: 42.9 ±33.2, OSAsws: 30.9 ±25.6, OSAsws+O2: 39.5 ±36.9 in pg/mL).

Conclusion: Although we were able to recapitulate OSA in SWS, the degree of OSA severity was less than that on subjects' diagnostic studies, and breathing was normal in N1, N2, and REM sleep, factors which possibly account for the lack of significant differences in biomarkers between conditions.

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0222

GREATER SLEEP REGULARITY IS ASSOCIATED WITH SLOWER PACE OF EPIGENETIC AGING

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Introduction: Sleep timing regularity is an important component of overall sleep health. People with more irregular sleep-wake schedules may more rapidly incur marks of biological aging, such as altered DNA methylation (DNAm). Here, we test whether sleep regularity index (SRI), a metric of the consistency of sleep-wake epochs, is associated with accelerated epigenetic aging in the Multi-Ethnic Study of Atherosclerosis (MESA).
Methods: SRI was calculated from scored sleep-wake epochs derived from actigraphy (wrist-worn ActiWatch Spectrum) collected over a week during the MESA Sleep Ancillary Study. Three epigenetic "clocks" representing markers of biological (Horvath DNAmAge 2018; developed by selecting DNAm sites associated with chronological age), phenotypic (Levine PhenoAge; developed by selecting DNAm sites associated with age-related biomarkers), and pace of aging (Belsky DunedinPACE; developed by selecting DNAm sites associated with individual trajectories of age-related biomarkers) were constructed from whole-blood DNAm data (EPIC Illumina Array) collected at MESA Exam 5, prior to actigraphy measurement. Associations between epigenetic age acceleration (outcome; the difference between chronological age and epigenetic age) and SRI (exposure, 10-unit increase) were evaluated with linear regression models adjusted for age, gender, study days between blood collection and actigraphy, self-reported race/ethnicity, study site, BMI, smoking status, depression score, and sleep duration.
Results: 431 MESA participants with valid actigraphy and DNAm data were included (mean chronological age=68 years, DNAm age=66 years, PhenoAge=56 years, pace of aging=1.01). Spearman correlations between chronological age and epigenetic aging measures were highest for biological aging (DNAmAge rho=0.89, PhenoAge rho=0.76, DunedinPACE rho=0.18). Results did not support an association between SRI and accelerated biological aging (DNAmAge; β=0.09, 95%CI:-0.23, 0.41) or phenotypic aging after additional adjustment for smoking (PhenoAge; β=-0.48, 95%CI:-1.0, 0.04). However, greater SRI was associated with slower pace of aging in fully adjusted models (10-unit SRI increase on DunedinPACE; β=-0.09, 95%CI:-0.02, -0.0004) and directionality was similar between PhenoAge and DunedinPACE.
Conclusion: Greater sleep regularity is associated with slower pace of aging in a cross-sectional analysis of older U.S. adults. Further work will assess epigenetic aging with other measures of sleep health.
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0223

TEMPORAL CORRELATIONS IN MOTOR ACTIVITY FLUCTUATIONS AND RISK OF PARKINSON'S DISEASE IN MIDDLE-TO-OLDER AGED ADULTS

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Introduction: Physiological outputs such as motor activity display complex fluctuations with a delicate pattern balanced between randomness and excessive regularity. Altered fractal patterns were observed in patients with Parkinson's disease (PD). We examined whether perturbed motor activity fluctuation patterns are associated with the risk of developing PD in middle-to-older aged adults.
Methods: Actigraphy recordings (up to 7 days) were collected from more than 100,000 participants in the UK Biobank between 2013-2015. Participants were followed after actigraphy assessments for up to 7.5 years (median: 5 years). The detrended fluctuation analysis was performed to obtain a scaling exponent, α, that quantifies temporal correlations in activity fluctuations at timescales ~6-90 min: α close to 1 indicates the highest complexity or the balance between randomness and excessive regularity as observed in health young adults; deviations from 1 indicate reduced complexity — more randomness (close to 0.5) or excessive regularity or rigidity (close to 1.5) as occurred with aging or in diseases. We performed Cox proportional hazards models to examine the association of |α-1| with incident PD (ascertained by ICD-10 codes) during the follow-up while adjusting for age, sex, education, ethnicity, obesity, sleep apnea, alcohol intake, smoking status, morbidity burden, circulatory system disorder, and Townsend Deprivation Index (TDI).
Results: In total, 94,041 participants (56.4% females; age: 62.4±7.83 [SD], range 43.5-79.0 years) who had valid actigraphy or had no PD diagnosis at baseline were included. Among them, 290 participants (~0.3%) developed PD after 3.7±1.8 [SD] years from baseline. Older age (hazard ratio [HR] per 1 year increase=1.15, 95% CI: 1.12-1.17, p< 0.0001) and being male (HR= 2.42, 95% CI: 1.88-3.13, p< 0.0001) were associated with a higher risk of developing PD. The mean and SD of the squared root transformed |α-1| were 0.2±0.1. With a square root transform on |α-1| (to account for the right skewed distribution) and after controlling for co-variables, larger |α-1| was associated with increased risk of developing PD (for 1-SD increase, HR=1.15, 95% CI: 1.02-1.28, p=0.017; Q4 vs. Q1: HR=1.46, 95% CI: 1.05-2.04, p=0.025).
Conclusion: Perturbed balance between randomness and regularity in motor activity fluctuations was associated with higher PD risk.
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0224

SLEEP DEPRIVATION AND RECOVERY SLEEP IMPACT SERUM BIOMARKERS OF ALZHEIMER'S DISEASE IN RETIRED ADULTS

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Introduction: Short sleep increases Alzheimer's disease (AD) risk, and sleep facilitates clearance of AD-related metabolites. Blood-based AD biomarkers (e.g., beta amyloid [Aβ] 42/40 ratio, phosphorylated tau181 [p-Tau181], neurofilament light chain [NfL], glial fibrillary acidic protein [GFAP]) are validated and increasingly used clinically. However, the impact of sleep deprivation and recovery sleep on these markers is unclear. This study determined the effects of sleep deprivation and recovery sleep on serum AD biomarkers in retired adults and explored: 1) whether changes in EEG slow-wave activity (SWA) from

baseline to recovery sleep were associated with serum AD biomarker changes, and 2) whether findings differed between retired night shift and day workers.
Methods: Participants were 58 cognitively normal retired shift workers (n = 28) and retired day workers (n = 30). All completed a 60-hour laboratory study including a baseline night of EEG sleep recording, one night of total sleep deprivation, and one night of recovery sleep. EEG SWA (0.5-1Hz) was assessed during baseline and recovery sleep. Blood was collected the morning after each night. Serum samples were analyzed for Aβ40, Aβ42, p-Tau181, NfL, and GFAP using ultra-sensitive immunoassay. Linear mixed models determined the effects of sleep deprivation and recovery sleep on biomarker levels adjusted for age, sex, race/ethnicity, and education.
Results: Mean participant age was 67.8 +/- 5.5 years, 52% were female, 86% were White, and mean education was 16.0 +/- 1.9 years. Serum Aβ42/40 ratio, NfL, and GFAP decreased following one night of sleep deprivation. Following recovery sleep, the Aβ42/40 ratio remained below baseline, while NfL and GFAP increased to baseline levels. Serum pTau-181 did not change following sleep deprivation or recovery sleep. Greater SWA increase from baseline to recovery sleep was associated with smaller Aβ42/40 ratio decrease. Findings did not differ between shift and day work groups.
Conclusion: In retired adults, acute sleep deprivation and recovery sleep impacted serum AD biomarker levels. Sleep characteristics may therefore affect the diagnostic accuracy of these tests. Former night shift work exposure did not influence serum biomarker responses, suggesting no effect of long-term shift work exposure over time. SWA may aid Aβ clearance during sleep.
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0225

ACTIGRAPHY-ASSESSED DAYTIME NAPPING LINKS TO MILD COGNITIVE IMPAIRMENT AND DEMENTIA IN MIDDLE-TO-OLDER AGED ADULTS

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Introduction: Prior studies of older adults have demonstrated that the development and progression of Alzheimer's disease are tightly linked with longer daytime naps in a potentially bidirectional manner. It remains unclear whether daytime sleep behaviors in middle-to-older aged adults are linked to the risk for dementia.
Methods: We studied 85,037 cognitively intact non-shift-workers (baseline age=63 years, SD=8, range: 43-69; 57% female) in the UK Biobank cohort who completed 7-day actigraphy and had been followed for up to 8 years. We implemented the Cole-Kripke algorithm to identify daytime sleep episodes and considered three types of napping metrics: (1) mean nap duration between 9am-7pm; (2) intra-individual variability (individual SD) in the nap duration between 9am-7pm; (3) timing of napping quantified as the percentage of nap duration in each 2-h bin between 9am-7pm (9-11am, 11am-1pm, 1-3pm, 3-5pm, 5-7pm). Incidences of all-cause dementia and mild cognitive impairment (MCI) were identified via ICD-10 codes. Nap variables were square-root transformed to correct for skewness. We conducted Cox proportional hazards models, adjusting for demographic characteristics, lifestyle, comorbidities, polygenic genetic risk score for Alzheimer's disease, nighttime sleep, and chronotype.
Results: Almost all participants (99.97%) napped at least once. Median nap duration was 0.40 hours per day (IQR=0.20-0.78), and intra-individual variability of nap duration was 0.39 (IQR=0.19-0.69) hours. Twenty-eight percent (IQR=12%-52%) of the naps were taken between 9-11am, 5% (IQR=0%-17%) between 11am-1pm, 9% (IQR=0%-22%) between 1-3pm, 16% (IQR=1%-29%) between 3-5pm, and 17% (IQR=4%-32%) between 5-7pm. During follow-up, 557 (0.66%) participants developed MCI or dementia on average 4.62 (range: 0.01-7.98) years after baseline. Longer nap duration (for 1-SD, HR=1.21, 95%CI: 1.12-1.31, p< 0.0001), larger intra-individual variability (for 1-SD, HR=1.14, 95%CI: 1.04-1.24, p=0.004), and higher percentage of naps between 1-3pm (for 1-SD, HR=1.11, 95%CI: 1.02-1.22, p=0.017) were associated with increased risk for MCI/dementia.
Conclusion: Longer and increased intra-individual variability in daytime nap as well as higher percentage of naps in the early afternoon are associated with a greater risk of MCI/dementia in middle-to-older aged adults. These findings highlight the potential importance of monitoring napping in screening for the risk for developing dementia.
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0226

A NOVEL GABAERGIC DIETARY SUPPLEMENT ENHANCES SLEEP QUALITY IN OVARIECTOMIZED MICE

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Introduction: Sleep disruptions affect 56% of the population. Sleep disorders are common symptoms facing peri- and post-menopausal women. Ovariectomized rodents are a common study model for research on menopausal symptoms. The primary objective of this investigation was to evaluate the effects of BH_SLP_01 (Bonafide Health Sleep Product) on sleep quality and brain wave patterns in ovariectomized mice.
Methods: Five female BALB/c mice (age: 8 weeks, body mass: 180±20g) were allocated per treatment arm. After an adaptation period, all mice were ovariectomized (OVX). Treatment groups included caffeine control (control) and caffeine + BH_SLP_01. Both groups were treated with caffeine to induce sleep disturbance. Caffeine (7.5mg/kg) was injected intraperitoneally at the 15th minute of recordings, and second injections (saline or combinations) were performed at the 30th minute (min). Brain electrical activity was monitored and recorded for two hours total using electrocorticography (ECoG). Serum melatonin, serotonin, and dopamine were measured by ELISA. Brain levels of MDA were measured by HPLC and protein concentrations were determined using Western Blot analysis. Study treatments were compared using an ANOVA, Tukey's post-hoc test, and Student's unpaired t-test. Significance levels were set at < 0.05.

Results: Analysis of ECoG recording data revealed notable findings. Significant differences in amplitude were seen at 15-30, 45-60, 60-75, and 75-90 min time points for the BL_SLP_01 group compared to control. Significant differences in frequency were seen at 15-30, 30-45, 45-60, 60-75, 75-90, and 90-105 min timepoints for the BH_SLP_01 group compared to control. Additionally, serotonin, dopamine, melatonin, brain MDA, GABA-A R2, GABA-B R1, GABA-B R2, 5-HT1A, GluA1, GluN1, GluN2A, Bax, Bcl-2, and Caspase-3 levels were significantly improved by BH_SLP_01 compared to control ($p < 0.05$).
Conclusion: This study provides evidence for the efficacy of BH_SLP_01 to improve impaired sleep in a menopausal model. This conclusion is supported by notable enhancements in sleep architecture demonstrated by ECoG recording data. Furthermore, the results show an upregulation of GABA, glutamine receptors, and natural melatonin, all of which collectively contribute to sleep quality. These findings underscore the potential of BH_SLP_01 as a promising therapeutic intervention for menopausal women experiencing sleep stress and disturbances.
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0227

ASSOCIATION BETWEEN SLEEP QUALITY AND SLEEP DURATION AND PHYSICAL FRAILTY AMONG OLDER ADULTS IN INDIA

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Introduction: Considering the significant growth in India's aging population, it is imperative to identify risk factors associated with frailty among older Indians. However, there is limited studies that assessed the linkage between sleep and frailty in this population and it is focused on sleep disorder. The purpose of this study was to examine the association between sleep quality, sleep duration, and physical frailty among older Indian adults.
Methods: Data come from the World Health Organization's Study on global AGEing and adult health (WHO-SAGE), India wave-2 (2013-14). The sample size comprised 6,512 older adults aged 50 years and above. Pre-frailty and frailty were assessed using the modified version of the frailty phenotype proposed by Fried and colleagues. Sleep was assessed by self-reported quality and duration. Multinomial logistic regression analysis was employed to examine the associations of sleep quality and duration with pre-frailty and frailty.
Results: A total of 66.7%, and 25.3% of older adults in our sample were pre-frail and frail, respectively. A higher prevalence of frailty was found among those with poor sleep quality (44.8%) and with short sleep duration (< 7 hours/night; 32.2%). Relative to peers with good sleep quality, the odds of frailty were significantly higher among older adults with poor sleep quality [AOR: 2.79; CI: 1.37–5.66]. And, notably, compared to those who enjoyed the recommended age-appropriate amount of sleep (7-8 hours), older adults with long sleep duration (≥ 9 hours) reported a significantly lower likelihood of both, pre-frailty [AOR: 0.73; CI: 0.57-0.93] and frailty [AOR: 0.68; CI: 0.51-0.91].
Conclusion: Our study found both sleep quality and quantity to be associated with pre-frailty and frailty among older Indians. Poor sleep quality may increase risk for frailty, yet long sleep duration may be a protective factor independent of the quality of sleep.
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0228

CHEMOGENETIC ACTIVATION OF NORADRENERGIC A7 AND SUBCOERULEUS NEURONS INHIBITS GENERATION OF REM SLEEP IN AGING MICE

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Introduction: The generation of REM sleep involves mutually inhibitory interactions between brainstem aminergic and cholinergic neurons. The silencing of Locus Coeruleus and A5, noradrenergic neurons during REM sleep have been proposed to play a permissive role in the occurrence of REM sleep. Since noradrenergic SubCoeruleus (SubC) and A7 neurons have similar sleep-wake pattern of activity, we tested whether these neurons also participate in the regulation of the sleep-wake cycle in young and aging mice.
Methods: Fourteen adult DBH-cre mice (young 3-6 month-old, 4 males and 3 females; and aging 21-26 month-old, 5 males and 2 females) were bilaterally injected with excitatory M3-DREADD into A7/SubC pontine noradrenergic region. In two weeks, mice were implanted with EEG and neck EMG electrodes to record sleep-wake behavior. Four weeks following the DREADD injections, the mice were habituated to sleep-wake recording system. The EEG and neck EMG were collected from 9 am to 7 pm, and randomized CNO (0.3 mg/kg, i.p.) or saline injections were administered at 12 pm during experimental sessions. Sleep scoring was performed using SleepSign and sleep-wake states were manually defined in 5 s epochs. The duration of time spent in wakefulness, NREM, and REM sleep was calculated per hour for saline and CNO sessions. Pontine sections were processed for tyrosine hydroxylase (a marker for noradrenergic neurons) immunohistochemistry, and mCherry-positive (DREADD) A7/SubC neurons were counted.
Results: CNO tended to reduce total duration of REM sleep compared to saline injections within the first two hours after the injections in young (2.5 + 0.8 (SE) min vs. 4.6 + 0.8 min, n=7, p=0.078) and significantly decreased in old (2.5 + 0.6 min vs. 5.6 + 0.6 min, n=7, $p < 0.001$, paired t-tests) mice. The total duration of REM sleep was negatively correlated with the number of mCherry-positive, M3-expressing noradrenergic neurons.
Conclusion: The obtained results suggest that activation of A7/SubC noradrenergic neurons negatively affect REM sleep generation, which was more pronounced in older animals. These findings suggest a novel role for both SubC and A7 noradrenergic neurons in the regulation of REM sleep.
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0229

POOR HABITUAL SLEEP QUALITY PREDICTS HEIGHTENED INTEROCEPTIVE AWARENESS PARTICULARLY WITH OLDER AGE

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Introduction: Interoception is the sensation of the body's internal states. Previous literature suggests that disordered sleep, including insomnia, in younger participants is associated with altered interoceptive awareness. However, the relationship

between habitual sleep and interoception in healthy individuals observed across the adult lifespan, including old adults who tend to have poorer sleep quality, remains unclear.
Methods: Here, we aimed to disentangle the impact of poor habitual sleep and older age on interoceptive awareness. Seventy-two participants ranging across the adult lifespan (ages 18 to 78) were asked to perform subjective and objective measures of interoception. Specifically, they completed a self-report questionnaire regarding subjective interoceptive beliefs and performed an objective tapping task in which they tapped in resonance with their perceived heartbeats. Finally, we varied demands on autonomic arousal by asking participants to rate the intensity of sensation in their heart in response to viewing emotionally arousing images. Their habitual sleep patterns were measured using actigraphy for 7 days.
Results: Higher levels of sleep discontinuity (i.e., WASO, fragmentation) predicted greater performance in the objective interoception heartbeat counting task (β=0.254, p=0.049) across age. Greater night-to-night variability in sleep time was associated with greater interoceptive awareness when autonomic arousal was manipulated in the emotional viewing task, particularly with increasing age (Age x Sleep Variability, β=0.279, p=0.023). Similarly, reduced sleep time predicted better interoceptive awareness in the same task, particularly with increasing age (Age x Sleep Time, β=-0.322, p=0.012). Higher levels of variability in sleep discontinuity, another indicator of poor sleep quality, predicted greater subjective interoceptive beliefs across ages (β=0.242, p=0.046).
Conclusion: The results support the idea that habitually poor sleep quality and increased sleep variability may contribute to better interoception, and that this relationship is strengthened with increasing age.
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0230
COMPARING SUBJECTIVE AND OBJECTIVE MEASURES OF CHRONOTYPES AND THEIR ASSOCIATIONS WITH AGE IN OLDER ADULTS

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Introduction: While much is known about the development and variability of chronotype (CT) in young adults, little is known in older adults, whose circadian rhythms tend to advance with aging. We assessed the associations between subjective and objective non-invasive chronotype markers, and their associations with demographics in older adults.
Methods: In an observational study of 60 community-living adults aged ≥60 years with self-reported sleep complaints, participants completed a Morningness-Eveningness Questionnaire (reduced version; rMEQ) and seven days of actigraphy. We dichotomized rMEQ into morning (>17) and other-CT(≤17). Seven-day average sleep midpoint, the midpoint between sleep onset and sleep offset, was measured by actigraphy. Seven-day average peak time in activity during the day was calculated using cosinor analysis of activity counts from actigraphy. Two-sample T-tests and Chi-square tests compared demographic factors (age, gender, race, education) and objective chronotype markers (sleep midpoint, peak time) between dichotomized CT groups (Morning-CT vs Other-CT). Pearson correlation coefficients examined the associations between the continuous rMEQ score and objective chronotype markers, and their associations with age.
Results: The mean age was 74±6.4 years [range: 60-90], 65% were women and 33.3% were minority race. Morning-CT (54%) and Other-CT (46%) had significantly different sleep midpoints (2:43 AM vs 3:20 AM, p=0.01) and different peak times (2:00 PM vs 3:00 PM, p=0.006). No significant differences were found in demographics between Morning-CT and Other-CT. Higher rMEQ score was significantly associated with earlier sleep midpoint (r=-0.52, p< 0.001) and earlier peak time (r=-0.51, p< 0.001). Advanced age was associated with earlier sleep midpoint (r=-0.46, p=0.0003), earlier peak time(p=-0.46, p=0.0003), and higher rMEQ score (r=0.22, p=0.09).
Conclusion: Among community-living older adults with sleep disturbances, we observed moderate correlations between subjective and objective chronotype markers. The rMEQ score significantly differentiated people with distinct objective chronotype markers, demonstrating the potential validity of rMEQ as a feasible marker for chronotype. Future studies with larger sample sizes should validate our findings, and could investigate whether subjective or objective chronotype markers have stronger associations with adverse outcomes.
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0231
EXPLORING AGE DIFFERENCES IN RELATIONSHIPS BETWEEN PRIOR SLEEP DURATION AND SLEEP LATENCY ON MSLTS

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Introduction: We investigated whether the relationship between daytime sleepiness and previous night's sleep duration changes with age using a protocol in which individuals were studied both after habitual sleep duration and after multiple days with extended sleep opportunities.
Methods: 35 younger (18-32 years old, 18 F) and 18 older (60-76 years old, 6 F) healthy participants were studied using polysomnography in an in-lab protocol (Klerman and Dijk, Curr. Biol. 2008). During night 1 (SP1), participants were scheduled to sleep based on their at-home sleep schedules. On day 2, the 5 sessions of a MSLT (MSLT_pre) began 2 hours after SP1 ended .Participants then began a schedule with 16 hrs (12 hrs at night and 4 hrs during day) of sleep opportunity in bed per 24 hrs for 7 days, followed by a second set of MSLTs (MSLT-post). Total sleep time (TST) for the nighttime sleep episodes prior to both sets of MSLTs was calculated. The median sleep latency and percent of the MSLT sessions in which participants fell asleep (PctSlept) within MSLT_pre and MSLT_post were calculated.
Results: Total sleep time on SP1 ranged from 5.4-9.7hr; only Younger participants had a TST >8.0 hr. Therefore, for analyses comparing Younger and Older participants, only TST of < 8.0 hr was used (21 Younger, 18 Older). All participants fell asleep at least once during MSLT_pre. During MSLT_post, 32%

of Younger and 8% of Older participants did not fall asleep during any of the MSLT sessions (i.e., PctSlept=0); therefore, latency-based analyses cannot be done for MSLT_post data. There was a negative correlation between SP1 TST and median sleep latency for MSLT_pre for Younger (Pearson R=0.35; p=0.049) but not Older participants. There was a negative correlation between SP1 TST and PctSlept for Younger (Pearson R=-0.47, p=0.006), but not Older participants. There was no relationship between TST before MSLT_post and the PctSlept for either Younger or Older participants. Repeated measures ANOVA testing (MSLT_pre vs MSLT_post) found a time (p< 0.001) and time*agegroup (p=0.008) effect for PctSlept.
Conclusion: The relationship between the prior night's sleep and daytime sleepiness may change with age.
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0232
ASSOCIATION OF SLEEP QUALITY AND SLEEP DURATION WITH COGNITIVE FRAILTY IN OLDER CHINESE ADULTS

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Introduction: Cognitive frailty refers to the co-occurrence of physical frailty and cognitive impairment. The aim of this study is to examine the associations of sleep quality and sleep duration with cognitive frailty among older Chinese adults.
Methods: We analyzed data from the 2008 wave of the Chinese Longitudinal Healthy Longevity Survey. In total, 11,293 participants aged ≥ 65 years old (mean age 85 years; 6032 females) who had cognition and physical frailty assessments at baseline were included. Participants were considered physically frail when meeting ≥3 of the following criteria: shrinking, weakness, slowness, exhaustion, and inactivity; and were considered mild cognitive impairment if the Mini-Mental State Examination score □22. Cognitive frailty was identified as the presence of both physical frailty and mild cognitive impairment. Sleep quality was assessed based on answers to the question "How about the quality of your sleep?" A score "poor" was rendered if the answer was "so so", "bad", or "very bad", and a score "good" was rendered otherwise. Sleep duration was estimated based on the answers to the question "How many hours do you sleep normally?", was further categorized into short (< 6 h), normal (6-9 h), and long (>9 h). Multivariate logistic regression models were performed to assess the associations of sleep quality and sleep duration with cognitive frailty adjusting for age, sex, education, residence, economic status, marital status, and multimorbidity.
Results: Among all participants, 1,297 (11.5%) were identified as having cognitive frailty. Poor sleep quality was found in 3,794 (33.6 %) participants. Numbers of participants who reported short, normal, or long sleep duration were 1,325 (11.7%), 7,200 (63.8%), and 2,768 (24.5%). Compared with those who had good quality, participants who had poor sleep quality were at a higher risk for cognitive frailty (odds ratio [OR]=1.36, 95%CI=1.19-1.56, p< 0.001). Compared to participants who had normal sleep duration, the odds of having cognitive frailty were also higher in those with short (OR=1.29, 95%CI=1.05-1.59, p< 0.05) or long sleep duration (OR=1.52, 95%CI=1.32-1.74, p< 0.001).
Conclusion: Poor sleep quality and abnormal sleep duration were associated with cognitive frailty among older Chinese adults.
Support (if any): BrightFocus Foundation (A2020886S), NIH RF1AG064312

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0233
ACTIGRAPHY-DERIVED SLEEP PROFILES IN OLDER MEN: INSIGHTS INTO COGNITIVE AND CARDIOVASCULAR HEALTH RISKS

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Introduction: While growing attention has been given to understanding the multidimensionality of sleep, research has primarily focused on individual sleep characteristics. Therefore, the link between actigraphy-derived 24-hour sleep/circadian profiles and the incidence of dementia and cardiovascular disease (CVD) events in healthy older men remains unexplored.
Methods: We analyzed actigraphy-derived sleep/circadian data gathered from 2,667 men participating in the Osteoporotic Fractures in Men (MrOS) Sleep study. Sleep/circadian profiles were determined using multiple coalesced generalized hyperbolic mixture modeling, based on 20 sleep parameters and circadian activity rhythms variables. Multivariable Cox models were performed to investigate how these sleep profiles related to the incidence of dementia and CVD events over a 12-year period.
Results: We identified three sleep profiles: active healthy sleepers (characterized by high sleep efficiency; strong circadian rhythmicity; and high activity during wake periods), fragmented poor sleepers (low sleep efficiency; high sleep fragmentation; short sleep duration; and weak circadian rhythmicity), and nappers (more frequent and longer naps; and high sleep efficiency). Over the 12-year follow-up, compared to active healthy sleepers, fragmented poor sleepers had significantly increased risks of dementia and CVD events (Hazard Ratio (HR)= 1.47, 95% confidence interval (CI)= 1.08;1.98 and HR=1.34, 95%= 1.11;1.63, respectively), whereas nappers had a higher risk of CVD events (HR= 1.18, 95% CI= 1.00; 1.40) but not dementia incidence (HR= 1.14, 95%CI= 0.87;1.49).
Conclusion: In older men, fragmented poor sleepers' profile was associated with less favorable cognitive and cardiovascular health over 12-year follow-up, indicating a potential target for sleep intervention. Nappers' profile was linked to increased risk of CVD events incidence, but not with the incidence of dementia. These results suggest that different sleep profiles may influence cognitive and cardiovascular health through distinct mechanisms.
Support (if any):

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0234
WEARABLE-DERIVED TEMPERATURE MEASURED DURING SLEEP ALLOWS MENSTRUAL CYCLE STUDY AT DIFFERENT REPRODUCTIVE STAGES

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Introduction: Numerous physiological processes display menstrual cycle variations, including body temperature. The advances in quality and accessibility of wearables facilitate collecting time series of physiological data, including skin temperature during sleep. The cosinor method, frequently used in circadian rhythms biology, may be a useful tool to assess if a menstrual cycle is ovulatory, based on a biphasic temperature rhythm. It could also be used to derive metrics about the cycle, in turn allowing the investigation of rhythm characteristics of females at different reproductive stages.
Methods: Here, 67 females in the early reproductive (age: 25.5 ± 5.4 years (mean ± SD)) and 53 females in the late reproductive/menopausal transition (age: 47 ± 2.9 years) stages tracked sleep and temperature with an Oura ring 2 across a menstrual cycle. They also reported menses and used an ovulation kit that detects a rise in luteinizing hormone. A cosinor method was fitted to daily skin temperature points extracted during the sleep period, and the fit quality was compared with the ovulation kits results. The cycle metrics were extracted and compared between the two groups with Wilcoxon tests.
Results: With the cosinor method, a cycle was considered ovulatory when the fit had a r2 > .25, a method that agreed with the ovulation kit in 82% of cases. When the fit quality was r2 > .4, the model was considered sufficiently good to calculate derived metrics. There was no difference in the fit quality, acrophase relative to menses, or amplitude of the rhythm between the early and late reproductive/menopausal transition groups. However, the latter had a higher mesor compared with the early reproductive stage group ($p = 0.03$).
Conclusion: The cosinor method can be used to model not only circadian but also menstrual rhythms, allowing identification of ovulatory cycles, and derivation of metrics about menstrual cycle rhythms that can be used to track characteristics within and between individuals over time. The overall higher skin temperature rhythms found in the late reproductive/early menopausal transition group could reflect shifted temperature regulation and more heat dissipation during this stage.
Support (if any): National Institutes of Health (NIH) grant RF1AG061355 (Baker/Mednick)

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0235

TECHNOLOGY USE IMPACTED SLEEP PATTERNS IN OLDER ADULTS DURING AND AFTER THE COVID-19 PANDEMIC

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Introduction: Sleep, health status, and quality of life were highly impacted by the COVID-19 pandemic. Coping mechanisms such as using digital media and smartphones used to reduce social isolation, may have negatively impacted sleep. The purpose of this analysis was to examine the relationships between digital media use and sleep among older adults using data from the Experiences of Older Adults During COVID-19.
Methods: Community-dwelling older adults participated in an anonymous survey in 2020 during the initial months (N=509) of the COVID-19 pandemic, with a one-year follow-up in 2021 (N=118). A secondary cross-sectional analysis was conducted to examine the relationship between sleep and smartphone use. We used descriptive analysis, independent t-tests, and Pearson coefficients to measure linear correlation amongst age, gender, technology use, sleep variables, sleep duration, timing, onset latency, wake after sleep onset, and feeling refreshed upon awakening.
Results: Participants in both waves were predominantly female (75.2%; mean age 76.4 years), 49.5% married, and 40.7% living alone. Sleep satisfaction (<.001) and timing (<.001) significantly improved after COVID-19. Smartphone use was significantly lower post-COVID-19 (0.02). Smartphone use was negatively correlated with sleep duration, feeling refreshed upon awakening, and sleep satisfaction. Female sleep satisfaction correlated with sleep duration 6-8h/night (<.001) and timing (being asleep or trying to sleep between 2-4 am;<.001).
Conclusion: Sleep satisfaction and timing improved at the 2021 follow-up. Digital media and smartphones were used as tools for connection during social isolation; however, they impaired sleep duration, satisfaction, and feeling refreshed the next day. Female participants were more satisfied with longer sleep duration. Further studies with racially and gender diverse sample may provide insights on technology use and sleep in older adults post-COVID-19 pandemic.
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0236

PSYCHOMETRIC VALIDATION OF THE RU-SATED 4.0 MULTIDIMENSIONAL SLEEP HEALTH SCALE IN A REPRESENTATIVE U.S. SAMPLE

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Introduction: The construct of multidimensional sleep health is increasingly used to examine the impact of sleep on health. However, psychometric validation of self-report sleep health measures is limited. We developed the Ru-SATED 4.0 Multidimensional Sleep Health Scale to evaluate 6 sleep health dimensions (Regularity, Satisfaction, Alertness, Timing, Efficiency, Duration), including several alternative questions within dimensions. We assessed the comprehensibility and psychometric properties of Ru-SATED, yielding a finalized, valid measure of multidimensional sleep health among adults.
Methods: We conducted cognitive interviews (n=23) and lexile analysis. We then administered Ru-SATED and other self-reported sleep health measures via YouGov.com (n=2,000; stratified by age, sex assigned at birth, and racial/ethnic identity, representative of the U.S. population). We used factor analysis to identify the best combination of 6 items (1 for each dimension), then calibrated these 6 items using item response theory (IRT) Graded Response Model and explored the associations with legacy measures to establish Ru-SATED's construct validity.
Results: Cognitive interviews evaluated 8 items across dimensions of sleep health (including 2 alternate items for alertness and 2 for duration) and confirmed the comprehensibility of the

items/response options. The final set of 6 items had excellent model fit (RMSEA=0.08, SRMR=0.03, CFI=0.97, TLI=0.95) from factor analysis. In IRT calibration results, the location parameters ranged from -3.41 to 2.41 and the discrimination parameter ranged from 0.58 to 2.54, indicating the unique contributions of each item to the overall theta scores. Ru-SATED theta scores derived from IRT calibration had a mean of -0.01±0.83. Ru-SATED scores demonstrated acceptable convergent validity (|rs|=0.30 to 0.54) with other sleep scales (PSQI, PROMIS Sleep Disturbance, PROMIS Sleep-Related Impairment, Epworth Sleepiness Scale), and test-retest reliability (r=0.66) one month later. Ru-SATED scores significantly differed among those with (n=441, 22%) and without sleep diagnoses (n=1,558, 78%; Cohen's d=0.95, 95% CI=0.84 to 1.06), indicating acceptable known-groups validity.

Conclusion: These findings support the psychometric validity of Ru-SATED 4.0 with an advantage of IRT-derived theta scores. Ru-SATED is a brief, easy-to-complete self-report measure of 6 dimensions of sleep health that can be easily scored and interpreted in clinical and research settings.

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0237

ASSOCIATION BETWEEN HEALTHY SLEEP TIME AND BRAIN HEALTH IN US ADOLESCENTS-THE ROLE OF SOCIAL DETERMINANTS OF HEALTH

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Introduction: Recent studies highlight the importance of healthy sleep for adolescent brain development and memory. However, factors like night awakenings and social disparities can affect sleep quality, crucial for cognitive growth. Understanding these influences is key to addressing their impact on children's cognitive development. This study aimed to: I) Examine the relationship between healthy sleep and executive brain development in US adolescents, focusing on the mediating role of nightly awakenings; II) Explore how social determinants of health (SDoH) influence this relationship.
Methods: We analyzed cross-sectional data from Year 2 (2018–2020) of the ABCD Study (n = 5,742) focusing on Fitbit Charge 2 device-measured average sleep hours per night. Sleep was classified per American Heart Association guidelines, with a scoring system based on optimal sleep durations. Wake after sleep onset (WASO) was used as a mediator and brain health was assessed using MRI measurements of cortical and gray matter volume. The Child Opportunity Index (COI) was used to assess the potential effect modification of SDoH, categorized as very low, low, moderate, high, or very high.
Results: In our study of 5,064 adolescents, averaging 11.9 years old, the typical sleep duration was 7.4 hours per day, and the average nightly awakenings was 36.9 minutes daily. We found that those with healthier sleep patterns had a larger total whole brain cortical volume (β = 440.2; 95% CI, 371.3 to 509.1). SDoH significantly buffers this association, particularly in the moderate to very high COI categories. Notably, WASO did not mediate this relationship. However, in the very low COI group, longer healthy sleep was inversely related to gray matter volume (β = -20.09; 95% CI, -38.18 to -2.00), with WASO mediating 5.1% of this association.
Conclusion: Adequate healthy sleep time correlates positively with brain-healthy development (brain cortical volume), and this association varies with socio-economic factors. In adolescents with very low Child Opportunity Index scores, healthy sleep time is inversely associated with gray matter volume, with wake-up during the night as an important mediator. These findings suggest the need for targeted strategies to enhance sleep and brain health among socio-economically disadvantaged adolescents.
Support (if any): UTHealth Houston NIH

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0238

DISPARITIES IN SLEEP, ASTHMA, AND THE SLEEP CONTEXT IN URBAN CHILDREN

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Introduction: Children who have asthma and live in urban settings experience challenges that can complicate asthma management and compromise sleep outcomes. The goals of this presentation are to 1) describe environmental factors in children's homes impacting asthma and sleep, 2) examine associations between asthma and sleep outcomes in urban children, and 3) examine the moderating role of environmental and behavioral factors in the association between asthma and sleep outcomes.
Methods: 140 children 7-9 years old with persistent asthma and their primary caregivers completed a 16-day observational protocol. Asthma and sleep outcomes were evaluated via self/caregiver report (Asthma Control, Sleep Hygiene) and objective (portable handheld spirometer, actigraphy) methods. Home sleep and asthma environment was assessed with a structured interview.
Results: The most prevalent environmental risk factors for asthma and sleep were tobacco smoke (25% of sample), pets (42%), and pests (e.g., rodents, roaches, etc.; 34%). Sleep hygiene/environmental factors reported by families as challenging included child routinely falling asleep (48% of sample) or sleeping all night (48%) in a room not intended as their sleep space. Shared sleep space (40%) and lack of protective allergy bedding (40%) were also common challenges. Numerous factors causing objectively measured nighttime awakenings and sleep disruption were also reported. On average, children with well-controlled asthma reported more optimal sleep hygiene behaviors (rho = .91, p<.05) relative to those with poorly controlled asthma. Better day-to-day lung function (via spirometry) was related to fewer nighttime awakenings, measured with actigraphy (rho = .20; p's <.05). Children with poorly controlled asthma tended to have more night awakenings and lower levels of sleep efficiency than those with well controlled asthma. Analyses testing a moderating role of environmental/behavioral processes are underway.
Conclusion: Urban children's sleep environment contains asthma and sleep-related factors that make it challenging to fall and stay asleep. These disruptors affect both asthma activity and sleep and are areas to target in future multi-component asthma and sleep interventions.
Support (if any): NHLBI R01HL142058 (Koinis Mitchell and Carskadon); NIGMS 5P20GM139743 (Carskadon)

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0239

THE RELATIONSHIP BETWEEN ASTHMA AND SLEEP IN ADOLESCENTS FROM THE FUTURE OF FAMILIES AND CHILD WELLBEING STUDY

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Introduction: Asthma has been linked to adverse sleep outcomes in adolescents but few studies have evaluated whether there are differences in the sleep health of adolescents with asthma from various racial/ethnic backgrounds. We aimed to test the association of asthma with sleep in a large, diverse, national sample of

adolescents and to examine potential associations between race/ethnicity and sleep in those with asthma.
Methods: Data from 3307 adolescents were collected at the age-15 wave from the Future of Families and Child Wellbeing Study, a longitudinal birth cohort. Parent-reported asthma diagnosis and self-reported sleep measures, including bedtime, sleep duration, and number of nights/week with trouble falling asleep and staying asleep, were collected. Objective sleep measures, collected via actigraphy (n=784), included sleep onset, 24-hour sleep duration, sleep maintenance efficiency, and wake after sleep onset (WASO). Separate linear regression models were used to test the association between asthma and sleep outcomes in the entire sample, and to test the association between race/ethnicity and sleep outcomes in those with asthma (n=193-820). Models adjusted for age, sex, race/ethnicity, family structure, primary caregiver's education, and household income to poverty ratio.
Results: Asthma diagnosis was significantly associated with more nights/week with trouble falling asleep in the entire sample (p<.001). Of those with asthma, 51.6% were African American, 25.1% were Hispanic/Latino, 11.8% were in the other category, and 11.5% were white. In those with asthma, race was significantly associated with multiple sleep outcomes. African American adolescents had an actigraphic sleep onset that was 1 hour earlier (p<.05) and reported sleeping 28.2 minutes less (p<.01) than white adolescents. Additionally, Hispanic/Latino adolescents had 9 more minutes of actigraphic WASO (p<.05) than white adolescents.
Conclusion: Overall we show that asthma is associated with more trouble falling asleep than those without asthma. Among those with asthma, we found shorter self-reported sleep duration and, unexpectedly, earlier sleep onset among African Americans and more WASO among Hispanic/Latino adolescents compared to White adolescents. Further studies should continue to explore the relationship between asthma and sleep by examining differences in asthma-related exposures that may underlie these sleep disparities.
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0240

ASSOCIATIONS BETWEEN PARENTAL EDUCATION LEVEL AND SUBJECTIVE SLEEP PARAMETERS IN CHILEAN SCHOOL-AGED CHILDREN

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Introduction: Healthy sleep is crucial for children's development. The literature suggests that higher parental education is associated with longer child sleep duration. However, little is known about how family education level affects children's sleep patterns in Chile. We aimed to investigate the relationship between parental education level and sleep patterns and sleep duration during the week and on weekends.
Methods: Two hundred and fifty-eight participants (6-13 years; 50% girls) were included in this cross-sectional study. Data collected were parent-reported and included: educational level of the household head, categorized as no schooling or primary school, secondary school, technical or higher (graduate) college degree, bedtime, midpoint of sleep and sleep duration on weekdays and weekends. General linear models were tested to calculate adjusted differences between parental education level categories, adjusted for age and gender, followed by a Tukey post hoc test.
Results: We found that higher parental education level was significantly associated with advancing children's bedtime on weekends (P = 0.007). Participants whose parents had a secondary school degree postponed their weekend bedtime by 0.36 hours (95% CI: 0.11, 0.61) compared to those whose parents had a technical or higher college degree. We also found that higher parental education level was significantly associated with advancing children's weekend midpoint of sleep (P = 0.044). Specifically, the weekend midpoint of sleep was earlier (−0.29 h; 95% CI: −0.06, −0.53) for participants whose parents had a technical or higher college degree than for parents with a secondary school degree. Surprisingly, we found that lower parental education was associated with children sleeping longer on weekends (P = 0.026). In detail, participants whose parents had no schooling or primary education had 0.45 h longer weekend sleep duration (95% CI: 0.04, 0.87) compared to those whose parents had secondary school level.
Conclusion: Higher parental education level was associated with earlier weekend sleep patterns in children. However, lower parental education levels were associated with children sleeping longer on weekends. These results could be useful for the development of parenting programs targeting different levels of education to promote optimal sleep duration and time, as well as the well-being of Chilean children.
Support (if any):

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0241

RACIAL/ETHNIC AND SOCIOECONOMIC DISPARITIES IN CIRCADIAN MISALIGNMENT IN ADOLESCENTS

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Introduction: Prior research has shown sleep health disparities as a function of race/ethnicity and socioeconomic status (SES). However, most studies focused on habitual sleep duration and its night-to-night variability. Few studies have examined the association of these social determinants with circadian misalignment metrics, such as sleep midpoint (SM), sleep irregularity (SI), and social jetlag (SJL). We hypothesize that adolescents who identify as a racial/ethnic minority or from low SES households have greater circadian misalignment as compared to non-Hispanic whites or those from high SES households.
Methods: We analyzed 377 adolescents from the Penn State Child Cohort (median 16y; 46% female; 22% racial/ethnic minority, of which 58% were Black/African American and 28% Hispanic) who had at least 3 nights of actigraphy. SM was defined as the intra-individual midpoint of the sleep period, SI as the intra-individual standard deviation of the SM across nights, and SJL as the absolute difference between SM on weekdays vs. weekends. SES variables included parent's professional status, student working status and zip-code level median household income and 5-year average percentage of high school/college graduates. Multivariate general linear models adjusted for sex,

age, sleep duration, and sleep variability as well as a composite score of SES variables.
Results: Adolescents identifying as a racial/ethnic minority, working part-time, belonging to a household of lower professional status, lower median income or with less high-school or college graduates had a significantly delayed SM (p=0.011, p=0.005, p=0.049, p=0.047, p=0.009 and p=0.004, respectively). Adolescents identifying as a racial/ethnic minority and belonging to a household of lower professional status had significantly increased SI (p=0.009 and p=0.028, respectively). Race/ethnicity or SES were not associated with SJL (p≥0.203). The association of race/ethnicity with a delayed SM and increased SI remained significant after adjusting for all covariates, including SES (p=0.009 and p=0.029, respectively).
Conclusion: Racial/ethnic disparities in the circadian timing of sleep are not fully explained by socioeconomic factors in adolescents. Beyond insufficient sleep, circadian misalignment and its upstream social determinants should also be a target of strategies to prevent sleep health inequalities in historically minoritized racial/ethnic groups.
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0242

SELF-REPORTED SHORT SLEEP IN OVERNIGHT WORKERS AND IMPOVERISHED INDIVIDUALS

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Introduction: Overnight shift work and rotating shift work have been consistently shown to have negative impacts on worker sleep health and therefore worker health overall. Factors associated socio-economic status (SES) have been shown to affect sleep in various ways. This study aims to identify the interaction between SES and night shift work and their impact on worker sleep outcomes.
Methods: Data for 9,212 workers ages 18 and older were acquired from the National Health and Nutrition Examination Survey (NHANES). Workers were divided into groups for overnight, evening, daytime, and rotating shift work. Using poverty income ratios (PIR) SES groups of poverty (PIR≤1), below median (PIR>1, ≤3) and non-poverty (PIR>3) were also formed. Membership within these groups as well as interaction terms between shift work and SES were regressed on short sleep (< 7 hours), extreme short sleep (≤5 hours), and unhealthy sleep (≤5 or >9 hours).
Results: A significant interaction was found between overnight shift work and short sleep, extreme short sleep, and unhealthy sleep (p< 0.001for each). The interactions seen were strongest for unhealthy sleep as opposed to short or extreme short sleep. Those in the below median SES group had the largest likelihood of poor sleep under all three classifications (p< 0.02 for all). African American individuals were also more likely to have unhealthy sleep with p< 0.001 for all classifications of poor sleep while being Hispanic had no significant impact on sleep. Surprisingly, interaction terms between overnight shift work and SES were not shown to be statistically significant.
Conclusion: Consistent with previous findings, overnight shift work is predictive of shorter sleep; however, overnight shift work was most strongly predictive of unhealthy sleep. This may be an indication that overnight shift may also lead to consistent oversleeping in some individuals. SES does not seem to have any compounding effects with overnight shift work. Future research should look at how overnight shift work may be leading to consistent oversleeping as well as why SES does not impact overnight shift effects.
Support (if any):

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0243

UNTANGLING THE COMPLEXITIES OF SLEEP AND DIET AFTER JOB LOSS IN UNDER-REPRESENTED MINORITY GROUPS

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Introduction: Obesity is a public health crisis disproportionately affecting underrepresented racial and ethnic minority (URM) groups; it is also linked to risk factors, like poor diet and poor sleep quality. Little is known about how URM groups sleep and eat after involuntary job loss, a stressful life event that could impact food choices through financial strain. To this aim, we examined whether individuals identifying as an URM with worse sleep (multidimensional composite, sleep fragmentation) would demonstrate worse dietary patterns over the next 18 months, as compared to individuals identifying as non-Hispanic and white (NHW).
Methods: Data were derived from ADAPT, an 18-month cohort study with 188 participants who experienced recent involuntary job loss. Participants completed a multi-model sleep assessment (Actiwatch-Spectrum, daily sleep diaries, interview) for the calculation of a multidimensional composite score; sleep fragmentation was operationalized as the number of wake bouts during the in-bed period. Participants completed 24-hour dietary recall interviews to compute the Healthy Eating Index (HEI)-2015 index. Mixed effects linear modeling tested interactions between URM identity (33% Hispanic or 30% Not White Race) and sleep indices over time.
Results: The HEI did not change significantly over time with multidimensional sleep health, when controlling for body mass index, biological sex, education, and reemployment. More wake bouts were associated with higher HEI scores (healthier diet) in URM individuals and lower HEI scores (less healthy diet) in NHW individuals (Estimate = -0.36, SE = .14, p < .05). This interaction was driven by lower consumption of refined grains and saturated fats and an increased consumption of greens and beans over time in URMs and less consumption of whole grains in NHW.
Conclusion: In a population of individuals who recently experienced involuntary job loss, sleep fragmentation was associated with dietary quality but multidimensional sleep health was not. The association between sleep fragmentation was in an opposite direction than hypothesized in URM individuals. Future research may benefit from testing the daily relationships between sleep fragmentation, the cost of foods, and resiliency factors (e.g., cultural differences in dietary choices) when under financial strain.
Support (if any): US National Institute of Health, National Heart, Lung, and Blood Institute (NHLBI,1R01HL117995)

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0244

TIME POVERTY AS A POTENTIAL PATHWAY OF SLEEP DISPARITIES AMONG FOUR DISABILITY POPULATIONS

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Introduction: Past research has found that increased sleep disparities in populations experiencing disability, and this has often been attributed to increases in pain, stress, and comorbid conditions. However, it is also possible that the excess time burdens imposed by life with disability may also play a mediating role, especially in those with other risk factors for time poverty.
Methods: The Behavioral Risk Factor Surveillance System (BRFSS) is an annual cross-sectional survey sampled to be representative of the non-institutionalized US adult population. Using the 2022 data for 18-65 year-olds, we conducted survey weighted linear regression models to evaluate the impact of four disability categories (deafness, blindness, mobility impairment, and difficulties with concentrating, remembering, or making decisions) on sleep duration in cumulative models 1) adjusting for age category and sex, 2) adding poor health and financial stress, and 3) stratifying by risk for time poverty (risk index based on employment, children in the home, caregiving load, poor access to reliable transportation, and rural location).
Results: The analytic sample included 153,040 adults, with 24.4% endorsing at least one of the four disabilities, with prevalence ranging from 4.4% (deaf or hard of hearing) to 14.0% (difficulty with concentrating, remembering, or making decisions). All four disability categories were associated with decreased sleep duration (such as a 20.2 minute deficit, 95%CI 16.7-23.7 in those with mobility impairment), which remained significant after adjusting for poor health and financial stress. The sleep deficits associated with disability categories were consistently about twice as large among those in the top decile of the time poverty risk index as in the rest of the sample.
Conclusion: All disability categories measured by BRFSS are associated with sleep disparities, and these are exacerbated among those with other risk factors for time poverty, consistent with the time burden hypothesis, as those with multiple risk factors for time poverty would have less flexibility to allocate additional time without sacrificing sleep. Especially given that those experiencing disabilities are under-represented in much of the broader sleep literature, as are those with time poverty, sleep disparities in these populations are a crucial area for more robust exploration.
Support (if any):

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0245

TREATMENT FOR OBSTRUCTIVE SLEEP APNEA BY AREA SOCIOECONOMIC DEPRIVATION IN SIX MILLION ADULTS

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Introduction: Area socioeconomic deprivation, as measured by the Area Deprivation Index (ADI), is associated with numerous adverse health and economic outcomes (e.g., cardiovascular events, hospital readmissions, Alzheimer's disease). This composite score is based on 17 health disparities indicators (e.g., income, education, employment, housing quality) used to rank relative disadvantage across communities, and is a widely utilized key social determinant of health and a validated marker of health risk. The purpose of this study is to determine the association between the ADI and OSA treatment initiation.
Methods: Our data source was the All-Payer Claims Database (APCD) for the Wisconsin Health Information Organization (WHIO). The APCD includes claims data (e.g., healthcare visits, procedures, pharmacy information) from health insurers, employers, and Medicaid. Inclusion criteria included continuous enrollment coverage for a minimum of 12-months prior to the date of OSA diagnosis (based on ICD code G47.33) and a diagnostic sleep test (based on CPT codes). ADI was measured at state and national levels. OSA treatment initiation was defined using Healthcare-Common-Procedure Coding System (HCPCS) codes. Rates of OSA treatment initiation were compared between individuals with OSA living in the highest and lowest ADI quantiles (e.g., the areas of greatest and least socioeconomic deprivation) using ordinary least squares (OLS) regression analysis to evaluate the directionality and significance of their association.
Results: Of N=6,026,463 participants in the overall sample, N=154,821 underwent OSA diagnostic testing, and N=43,601 were subsequently diagnosed with OSA. OSA treatment initiation was significantly, negatively associated with area socioeconomic deprivation based on National-ADI (Slope: -0.0011, $p< 0.0050$) and State-ADI (Slope: -0.0016, $p< 0.0050$). The highest rates of OSA treatment were observed in areas of greatest socioeconomic advantage (>70% in ADIs 15-25). Conversely the lowest OSA treatment initiation rates were observed in areas of greatest socioeconomic disadvantage (< 50% in ADIs 90-100), reflecting a 20% difference in the likelihood of OSA treatment between the highest and lowest levels of socioeconomic disparity.
Conclusion: Area socioeconomic deprivation measured by ADI is associated with significantly reduced OSA treatment initiation. Future research should seek to increase access to OSA care in areas of socioeconomic disadvantage to reduce sleep health disparities and achieve health equity.
Support (if any):

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0246

TESTING FOR OBSTRUCTIVE SLEEP APNEA BY AREA SOCIOECONOMIC DEPRIVATION IN SIX MILLION ADULTS

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Introduction: Area socioeconomic deprivation, as measured by the Area Deprivation Index (ADI), is associated with numerous adverse health and economic outcomes (cardiovascular, readmissions, Alzheimer's). This composite score is based on 17 health disparities indicators (income, education, employment, housing) used to rank relative disadvantage across communities,

and is a widely utilized key social determinant of health and a validated marker of health risk. The purpose of this study was to determine the association between the ADI and OSA testing and diagnosis.

Methods: Our data source was the All-Payer Claims Database (APCD) for the Wisconsin Health Information Organization from 2017-2022 and linked to the publicly available ADI. Sociodemographic variables were extracted from APCD including race, gender, and age. Inclusion criteria included continuous enrollment coverage for a minimum of 12-months prior to the date of OSA diagnosis (defined by ICD code G47.33) and a diagnostic sleep test (defined by CPT codes for PSGs and HSATs). ADI was measured at state and national levels. Rates of OSA testing and diagnosis were compared between individuals with OSA across the entire range of ADI scores using ordinary least squares (OLS) regression analysis.

Results: Of N=6,026,463 participants, n=1,310,286 were linked and included in the final sample: 53% women, Mean age=46.75[SD=22.2], National ADI=52.4[SD=20.2], ethnoracial demographic group affiliation: 22 self-identified categories), n=154,821 underwent OSA diagnostic testing, and n=43,601 were subsequently diagnosed with OSA (45% women, age=56.24[SD=16.2], National ADI=55.95[SD=20.88]). Diagnostic testing for OSA was significantly, positively associated with socioeconomic deprivation based on National ADI (slope: 0.0002, p< 0.005) and State ADI (slope: 0.0003, p< 0.005). The highest rates of OSA testing were observed in areas of socioeconomic disadvantage (>4.5%: ADI-decile 90-10). Conversely, the lowest OSA testing rates were observed in areas of socioeconomic advantage (< 2%: ADI-decile 0-10). Relative to individuals in socioeconomically advantaged areas (low-ADI), individuals in disadvantaged areas (high-ADI) were approximately 3% more likely to be tested for OSA.

Conclusion: Area socioeconomic deprivation measured by ADI is associated with a small but significant increase in OSA testing. Future research should seek to increase access to OSA care in areas of socioeconomic disadvantage to improve sleep health equity and reduce global health disparities.

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0247

IMPACT OF AREA SOCIOECONOMIC DEPRIVATION AND DEMOGRAPHIC VARIABLES ON MACHINE LEARNING MODELS FOR OSA TREATMENT

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Introduction: Ensuring equitable performance of sleep-related machine learning (ML) models is vital for public health and health equity. This research sought to determine the impact of sociodemographic and health disparities factors on the performance and characteristics of ML models designed to predict OSA treatment initiation.

Methods: Our data source was the All-Payer Claims Database (APCD) for the Wisconsin Health Information Organization (WHIO). Inclusion criteria included continuous insurance coverage for >12 months prior and >30 months after OSA diagnosis (defined by OCD code G47.33), and having undergone OSA diagnostic testing (defined by CPT codes). OSA treatment was defined based on durable medical equipment charges for PAP machines and supplies. Sociodemographic variables were extracted from APCD and included race, gender, age, and area socioeconomic deprivation (Area Deprivation Index; ADI). The ADI is a validated marker of health risk based on 17 health disparities factors ranking relative disadvantage across communities. Random Forest ML models were trained to predict OSA treatment initiation using sociodemographic variables and a medication history including 39,712 unique medications codified across 94 medication categories.

Results: Of N=6,026,463 subjects in the ACPD, n=154,821 underwent OSA diagnostic testing, and n=43,601 were diagnosed with OSA. 10-Fold Cross-Validation training-testing was applied to estimate sensitivity-specificity of ML models for predicting treatment initiation. Receiver operating characteristic curve area-under-the-curve (ROC-AUC) analyses were used to compare relative differences in predictive power of each variable. In ROC-AUC analysis of individual variables, the power for predicting OSA treatment were observed in relative rank order by age (0.568), race (0.547), ADI national-level (0.545), ADI state-level (0.544), gender (0.524), and medication history (0.516). In ROC-AUC analysis of combination variables, the highest ML model performance was observed in the combination of only three-variables (age-gender-race, 0.600), while the combination of all-variables showed an ROC-AUC value of (0.594), and the resulting performance difference was not statistically significant based on comparison of the ROC-AUC measures.

Conclusion: Demographic and health disparity factors may play an important role in future development of predictive AI/ML models. Population sleep health data represents an important resource to identify and bridge care gaps, reduce sleep health disparities, and achieve health equity.

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0248

THE ROLE OF NEIGHBORHOOD DEPRIVATION IN SLEEP HEALTH

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Introduction: Previous studies, mostly with small sample sizes, demonstrate inconsistent associations between the socioeconomic neighborhood environment and sleep among adults. Using data from a large cohort, we examined the association between neighborhood deprivation and sleep health.

Methods: The Cancer Prevention Study-3 is a large prospective cohort of American men and women enrolled at baseline between 2006 and 2013. The Neighborhood Deprivation Index (NDI) was derived for US census tracts using principal components analysis of 2008-2012 American Community Survey data on poverty, income, occupation, housing, employment, and education. Participant addresses at baseline were geocoded to the tract level and linked to the NDI. Participants (N=180,592) self-reported, in categories, their sleep duration in a 24-hour period on weekdays and weekends on the 2015 follow-up questionnaire and sleep quality in 2018. Weekly habitual sleep duration was

calculated from a weighted average of weekday and weekend durations. Multivariable logistic regression was used to estimate odds ratios (OR) and 95% confidence intervals (CI) for the association between NDI in quintiles and each sleep outcome, overall and by race and ethnicity.
Results: Participants had an average age of 48.6 (standard deviation=9.6) years and were predominantly women (79.2%). Most participants identified as White (93.5%), while smaller proportions identified with racial and ethnic minoritized populations (e.g., Black: 2.6%, Hispanic: 5.6%). Compared to the least deprived neighborhoods, living in the most deprived neighborhoods was associated with a 25% (OR=1.25, 95% CI 1.18-1.33) higher odds of short (< 7 hours) versus recommended (7-8 hours) sleep duration. Neighborhood deprivation was also associated with an increased odds of long sleep duration (≥9 hours; OR=1.13, 95% CI 1.06-1.21) and poor sleep quality (OR=1.06, 95% CI 1.01-1.10). Race and ethnicity modified the relationship between neighborhood deprivation and long sleep duration, such that the association was only observed among White participants.
Conclusion: Results from this large well-powered study indicate neighborhood deprivation may adversely impact sleep health by increasing the odds of shorter and longer than recommended sleep duration and poor sleep quality. More research in large diverse samples is needed to confirm these findings.
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0249
WITHDRAWN

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0250
IMPACT OF AIR QUALITY ON NOCTURNAL AWAKENINGS AMONG BLACKS

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Introduction: The Air Quality Index (AQIUS) is a measure of how clean or polluted the ambient air of a given area may be, scored 0-500 (0-50 excellent; 300< hazardous) based on components measurable in the air. Air Quality-related risk factors that affect health outcomes include preexisting diseases and low-socioeconomic status, factors that are disproportionately present in Black communities. Sleep plays a vital role in health outcomes and awakenings after sleep onset has been associated with an increased risk of cardiovascular related diseases. Previous research has also suggested that mechanisms explaining long-term health outcomes include air quality exposure during sleep. To understand those mechanisms, this study explores the association between average awakenings at night and AQIUS score among Blacks.
Methods: Data were pulled from 2 NIH-funded studies (ESSENTIAL and MOSAIC). Analyses of correlation matrices were conducted, descriptive statistics were analyzed, and linear regression analysis of AQIUS and average awakenings in minutes was performed using SPSS 29. For a period of seven days, 108 Black participants ≥ 18 years, monitored their bedroom's air quality using the IQAir device, which provided the AQIUS score during their sleep. Participants wore Fitbits for a week to track their sleep and physical activity. The effect of AQIUS on sleep parameters: average awakenings at night, sleep efficiency, quality, and duration was explored.
Results: Of 108 participants, 75 were Female (69.4%) and 33 were male (n=30.6%), Mage 48.31 ±16.725 years. On average, study participants experience 15.57±7.316 awakenings per sleep period. Number of awakenings was moderately negatively correlated (r(106)=.465,p<.001) with AQIUS, showing that as air quality decreases, the number of night awakenings increases. Regression analyses revealed AQIUS as a strong predictor of average awakenings in minutes at night in Blacks [β=-.248; p< .006].)
Conclusion: Air Quality Index is a robust predictor of average nocturnal awakenings among Blacks. Further research should investigate the importance of air quality to prevent cardiovascular diseases and to promote better overall health and sleep.
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0251
RACIAL RESIDENTIAL SEGREGATION AND OUTDOOR ARTIFICIAL LIGHT AT NIGHT: POTENTIAL CONTRIBUTORS TO SLEEP DISPARITIES

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Introduction: Racial/ethnic residential segregation (RRS) likely contributes to sleep health disparities. For instance, nighttime lighting for surveillance and policing efforts that vary by neighborhood racial composition likely contributes to differences in exposure to artificial light at night (ALAN), which disrupts melatonin production and sleep. Yet, the RRS-ALAN-sleep pathway is understudied.
Methods: To investigate RRS and ALAN as mediators of racial/ethnic differences in sleep among US adults, we geographically linked National Health Interview Survey (2011-2017) data to 2012 American Community Survey 5-year population estimates and outdoor ALAN data from the 2010-2011 US Defense Meteorological Satellite Program's Operational Linescan System. The local Getis-Ord Gi* was used to categorize RRS (low [z-score< 0], medium [0<=z-score<=1.96], high [z-score>1.96]). ALAN was divided into quintiles. Short sleep duration (< 7-hours) and poor sleep quality were self-reported. We used adjusted, survey-weighted robust Poisson regression to estimate prevalence ratios (PRs) and 95% confidence intervals (CIs); tested for effect modification by race/ethnicity; and assessed mediation using the Sobel's test.
Results: Among 126,539 adults (mean±SE age=46±0.1 years), RRS prevalence was 35% low, 43% medium, and 22% high. RRS and poor sleep were higher among minoritized adults (non-Hispanic Black (NHB), Mexican Latino, non-Mexican Latino, and Asian); ALAN was higher among non-Hispanic White (NHW) adults. High RRS was associated with a lower prevalence of ALAN (Q5 vs. Q1: PR=0.59 [95% CI:0.44-0.80]), short sleep (PR=0.94 [0.91-0.97]), and poor sleep quality (e.g., PR-trouble falling asleep =0.94 [0.90-0.98]), with no differences by race/ethnicity. ALAN was not associated with short sleep (sleep quality data unavailable). RRS explained differences in short sleep

between both NHB and Mexican vs. NHW adults (e.g., NHB: PR-total effect=1.30 [1.26-1.33]; PR-direct effect=1.39 [1.34-1.45]; PR-indirect effect=0.93 [0.89-0.98]) before but not after adjustment for ALAN (PR-indirect effect=0.97 [0.87-1.08]).
Conclusion: RRS was associated with lower ALAN and non-poor sleep. RRS attenuated sleep duration disparities among NHB and Mexican adults only prior to adjustment for ALAN. RRS and ALAN may be contrasting modifiable contributors to sleep disparities among US adults.
Support (if any): The findings/conclusions in this research are those of the authors and do not necessarily represent the views of the Research Data Center, National Center for Health Statistics, or CDC.

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0252

ASSOCIATION BETWEEN SLEEP ENVIRONMENT AND INSOMNIA AMONG HISPANICS IN FLORIDA

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Introduction: Insomnia prevalence among Hispanics is a significant public health concern, underscoring the need to uncover novel predictors of this sleep disorder. While prior studies have highlighted the high incidence of insomnia within this demographic, there is an urgent need to explore less-explored factors contributing to its development. Specifically, the impact of the sleep environment on insomnia symptoms in the Hispanic population. This study aims to bridge this gap by investigating the relationship between sleep environment quality and insomnia severity among Hispanics in Florida, offering fresh insights into the predictors of insomnia within this group.
Methods: Analyses include data from a Hispanic population in Florida (N= 221), ages 18-87 years that were enrolled in the NIH-funded heart health study, DORMIR. Participants completed several surveys on behavioral, clinical, social, and environmental determinants of sleep. For the current study, we measured insomnia symptoms via the Insomnia Severity Index (ISI) and the self-perceived quality of sleep environment was measured via the Assessment of Sleep Environment (ASE) survey. ISI measures presence and severity of insomnia symptoms and ASE asks respondents to rate their physical sleep environment by answering questions about the amount of light, temperature, and noise among other factors. Greater ISI scores indicate insomnia severity and greater ASE scores indicate worst sleep environment. To test whether sleep environment is associated with insomnia symptoms, we performed descriptive and inferential statistical analyses to characterize the sample as well as to determine the association between sleep environment and insomnia symptoms.
Results: Our population comprised 41% male (n=64) and 59% female (n=157). The mean ASE score of our total sample was 22.4±7.00 and the mean ISI score was 8.82±5.29. The regression model indicated that ASE was independently associated with ISI (F(1,219=6.09, B-0.12, p=0.0114), after controlling for sociodemographic, behavioral, and clinical variables.
Conclusion: Our results indicate that poorer sleep environments are associated with greater insomnia symptoms. These findings can be used to increase awareness of the benefits of monitoring the quality of sleep environments and associated risk of experiencing insomnia. These findings also elucidate the importance of limiting nighttime disturbances to improve quality of sleep.
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0253

SLEEP DISTURBANCES AND SHORT SLEEP DURATION AMONG RURAL AND NON-RURAL POPULATIONS

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Introduction: Rural populations experience a higher prevalence of insomnia and insufficient sleep compared to urban populations. The purpose of this study was to compare self-reported sleep disturbances and objective sleep duration measured using consumer-wearable devices among individuals living in rural versus non-rural communities.
Methods: Participants in this analysis were from the National Institutes of Health (NIH) All of Us (AOU) Research Program, a diverse US health database. We assessed rurality using an item on a self-report questionnaire measuring geographic isolation, dichotomized as rural or non-rural. Sleep disturbance symptoms were measured using item 3 on the Patient Health Questionaire-9, which assesses trouble falling or staying asleep or sleeping too much in the past 2 weeks. Objective total sleep time (TST) was measured using Fitbit devices. Participants with < 14 days of wearable data were excluded from TST analyses.
Results: Chi-squared analysis revealed that AOU participants living in rural communities were more likely to report sleep disturbance symptoms at least several nights per week (75.4%, n=1,552, □2(1) =165.6, p<.001) compared to individuals living in non-rural communities (59.2%, n=59,778). Linear regression analysis revealed that rurality was significantly associated with increased self-reported sleep disturbances (rural M=1.44, SD=1.12; non-rural M=.92, SD=.97; b=.424, SE=.025, F(3,59812)=1187, p<.001, adjusted R2=.056) and decreased objective average TST (rural M=351 min, SD=73, n=356; non-rural M=363 min, SD=75, n=11,760; b=-15.769, SE=3.980, F(3,12112)=75.93, p<.001, adjusted R2=.018), when controlling for age and sex.
Conclusion: Our findings align with previous research that individuals in rural communities typically experience poorer sleep than those living in non-rural communities. These results suggest a need for targeted sleep interventions for individuals living in geographically isolated areas of the US. Moreover, these findings imply that future research examining geographic sleep health disparities is warranted.
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0254

ACCULTURATIVE STRESS IS ASSOCIATED WITH SLEEP-RELATED IMPAIRMENT AMONG A SAMPLE OF RURAL AND URBAN LATINOS/AS

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Introduction: Latinos/as in the United States face distinctive sociocultural stressors rooted in their marginalized status, immigration experiences, and challenges adapting to a new culture. These stressors, including acculturative stress, contribute to elevated stress levels that can have detrimental effects on sleep health and may engender sleep-related impairment. While the association between stress and sleep difficulties is well-documented, the impact of acculturative stress on Latinos/as sleep health remains an understudied area. This study aims to illuminate the relationship between acculturative stress and sleep, highlighting a critical aspect of sleep health within this demographic.
Methods: This work utilized data from DORMIR, an NIH-funded study investigating multi-level determinants of sleep and heart health outcomes among urban and rural Latinos/as. Participants in New York and Florida completed surveys capturing biological, clinical, behavioral, psychosocial, and environmental determinants of health, including the Sleep-Related Impairment (SRI) and the Multidimensional Acculturation Stress Inventory (MASI) measures. We hypothesized that acculturative stress will be associated with sleep impairment outcomes and differentially across two locations. Linear regression analyses were performed to determine if acculturative stress predicted sleep-related impairments differentially in different geographical regions.
Results: Florida's sample (n=241, 35.6±14.7 years, 71% female) differed from New York's sample (n=112, 33.6±12.6 years, 61% female). For Florida participants, the average SRI score was 8.32±3.53 and the MASI score was 76.7±7.56. For New York participants, the average SRI was 9.35±3.50 and the MASI score was 87.6±25.1. Acculturative stress was found to be significantly associated with sleep-related impairment in Florida [$F(1,239) = 8.95$, $p=0.003$] and New York [$F(1,110) = 11.8$, $p=0.008$]. Regression analysis indicates greater acculturative stress predicted higher sleep related impairment in Florida ($\beta1=0.08$) and New York ($\beta1=0.04$), albeit a greater magnitude was observed in Florida.
Conclusion: Higher levels of acculturative stress predicted greater sleep-related impairments among Latinos/as in Florida and New York. With the recent influx of immigrants at the U.S southern border, this study illustrates the importance of addressing unique stressors like acculturative stress and its effect on sleep health among these populations. Further studies are needed focusing on reducing acculturation stress as a meaningful intervention for improving sleep health among Latinos/as in the United States.
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0255

ASSOCIATIONS BETWEEN COPING WITH DISCRIMINATION, SLEEP, AND MENTAL HEALTH AMONG BLACK SEXUAL MINORITY MEN

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Introduction: Black sexual minority men (SMM) suffer disproportionately from health inequities, including high rates of HIV, as well as poor mental and physical health. In addition to intersectional stigma and discrimination, sleep health, an understudied factor, may contribute to these health inequities. We examined the associations between coping with discrimination, sleep disturbances, and mental and behavioral health outcomes among Black SMM.
Methods: We recruited 191 Black SMM participants both in person at community-based events and organizations and online. Sleep disturbance, depression, anxiety, alcohol use, and quality of life were measured using PROMIS-Sleep Disturbance, Physical Health Questionnaire, Generalized Anxiety Disorder, Alcohol Use Disorders Identification Test, and PROMIS global health items. Experience of and coping with discrimination were measured using validated questionnaires. Regression and mediation analysis were conducted, controlling for age.
Results: One-quarter of the sample reported elevated levels of sleep disturbance. Experiences of racial discrimination were marginally associated with greater sleep disturbances ($b = 0.59$, $p = 0.07$). Effective coping (e.g., getting emotional support, thinking about steps to take) ($b = -2.62$, $p = 0.03$) and higher coping self-efficacy ($b = -2.00$, $p < 0.001$) were associated with fewer sleep disturbances. Less effective coping (e.g., self-blame, denial) was associated with more sleep disturbances ($b = 4.70$, $p = 0.009$). Greater sleep disturbance was associated with higher ratings of depression ($b = 0.04$, $p < 0.001$), anxiety ($b = 0.03$, $p < 0.001$) and lower ratings of quality of life ($b = -0.04$, $p < 0.001$), and marginally with greater alcohol use disturbances ($b = 0.12$, $p = 0.06$). Indirect paths via sleep disturbance were significant for the effects of effective coping or ineffective coping on depression, anxiety, alcohol use (for ineffective coping only), and quality of life.
Conclusion: Effective coping strategies appeared to mitigate sleep disturbances and other health challenges, underscoring the need for culturally congruent interventions that address both sleep and mental health to improve overall wellbeing in this population. Additionally, it is imperative to actively address intersectional stigma and discrimination. Mediation analysis was based on cross-sectional data and should be interpreted with caution.
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0256

DISCRIMINATION'S RELATIONSHIP WITH SLEEP ENVIRONMENTS ASSESSMENT IN THE SUNSHINE STATE VS THE EMPIRE STATE OF MIND

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Introduction: This study investigates the relationship between everyday discrimination and objective and subjective assessment of sleep environments in a sample of Florida and New York residents.
Methods: Our sample included 745 Black and African American individuals participating in NIH-funded community-based sleep studies conducted between January 2020 and November 2023 in the New York City or Tri-State area and South Florida. Data

encompassed demographics, zip code-based noise levels, overall air quality (IQAir), seven-day sleep-wake activities (Sleep Image Ring, and Actigraphy), Everyday Discrimination Scale (EDDS), and responses to the 13-item Assessment of Sleep Environment (ASE), measuring subjective experiences of environmental factors. Correlation analyses explored associations among continuous variables, ASE, noise scores, air quality, sleep-wake activities, and discrimination scores. Stratified multilinear regression analysis by state (Florida vs. NY), controlling for age and sex, examined relationships between sociodemographic factors, air quality, discrimination experiences, and ASE.

Results: Of the 745 participants, 57% were female (424), with a mean age of 47.8 years. A total of 27% (201) resided in New York, while 72.8% (542) were from South Florida. Participants in Florida were exposed to higher levels of Noise ($t = 6.097$, $df = 513$, $p < 0.001$), daily discrimination ($t = -2.036$, $df = 741$, $p = 0.021$), and perceived negative stimuli ($t = 5.512$, $df = 741$, $p < 0.001$) in their physical sleep environment compared to those in New York. No significant or strong association was found between objectively measured sleep health components and ASE or discrimination. Controlling for sex, age, and noise levels, among Florida residents, air quality (Beta = -0.332, $p < 0.001$) and discrimination (Beta = 0.331, $p < 0.001$) were the strongest independent predictors of ASE. In contrast, in NY participants, age (Beta = -0.274, $p < 0.001$) and air quality (Beta = 0.451, $p = 0.049$) were the strongest independent predictors of ASE.

Conclusion: Our analysis unveiled distinct patterns in exposure to discrimination and sleep environment assessment between Florida and New York, underscoring the importance of addressing the impact of discrimination on sleep and environmental assessment in policy and health outcomes.

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0257

MALADAPTIVE COPING MEDIATES ASSOCIATIONS BETWEEN EVERYDAY RACIAL/ETHNIC DISCRIMINATION AND INSOMNIA SYMPTOMS

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Introduction: Structural and interpersonal racism contribute to sleep disparities, likely due in part to heightened arousal/vigilance associated with the chronic stress caused by racial/ethnic discrimination. While working to address structural inequities is essential, it is important to identify how individuals cope – whether healthy/adaptive or maladaptive – with exposure to racial/ethnic discrimination to inform intervention targets since myriad coping strategies may either drive or buffer the effects of racial/ethnic discrimination on insomnia symptoms. Our study is the first to investigate whether associations between everyday racial/ethnic discrimination (e.g., treated as less intelligent/worthy/honest than others) and insomnia symptoms are mediated by coping strategies.

Methods: We used data collected over two follow-up periods from 29,137 women (n=903 Latina, n=1,702 non-Hispanic (NH)-Black, and n=26,532 NH-White) enrolled from 2003-2009 (mean±SD age=54.9±8.5 years) in the Sister Study cohort. In 2008-2012, participants self-reported everyday racial/ethnic discrimination experiences (ever vs. never) and healthy/adaptive (e.g., using emotional support) and maladaptive (e.g., behavioral disengagement) coping strategies ('not at all=1' to 'a lot=4'). Self-reported insomnia symptoms (yes vs. no to either difficulty falling or staying asleep) were obtained between 2017-2019. Mediation analysis was performed using PROCESS macro adjusting for sociodemographic/health (e.g., age, sleep medication use) characteristics to provide bias-corrected bootstrapped standard errors and confidence intervals for total, direct, and indirect effects.

Results: Overall, 9% of women reported everyday racial/ethnic discrimination, and prevalence varied by racial/ethnic group (79% among NH-Black, 31% Latina, and 4% NH-White). All racial/ethnic groups reported similar healthy/adaptive (mean±SD overall score=16.2±2.4) and maladaptive (mean±SD overall score=7.1±1.6) coping styles. The prevalence of insomnia symptoms was also similar across racial/ethnic groups (39%-44%). Maladaptive coping fully mediated/explained the relationship between everyday racial/ethnic discrimination and insomnia symptoms for NH-Black (βdirect effect=0.02, 95% CI [-0.229, 0.271]; βindirect effect=0.03, 95% CI [0.006, 0.062]) and partially mediated/explained for NH-White (βdirect effect=0.24, 95% CI [0.107, 0.367]; βindirect effect=0.04, 95% CI [0.025, 0.048]) women, but healthy/adaptive coping did not mediate/explain this relationship across racial/ethnic groups.

Conclusion: Maladaptive coping strategies explain relationships between racial/ethnic discrimination and insomnia symptoms among NH-Black and NH-White women, underscoring the need for interventions that address maladaptive coping strategies to mitigate the impact of racial/ethnic discrimination on sleep disturbances.

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0258

INTERSECTIONAL DISCRIMINATION: AN APPROACH TO UNDERSTANDING INSOMNIA SYMPTOMS IN MINORITIZED POPULATIONS

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Introduction: Minoritized groups in the United States experience discrimination that impacts their physical and mental well-being. People with multiple minoritized identities, such as being a racial/ethnic minority or sexual minority, often experience worsened health outcomes due to the intersectional nature of discrimination. The insidious nature of structural racism, classism, and genderism serves as a root cause of chronic disease disparities, including insomnia. This study aims to test the association of intersectional discrimination and symptoms of insomnia among minoritized populations with multiple marginalized identities.

Methods: In August 2022, US adults aged >18 years completed internet-based surveys. Demographic quota sampling was used to make the sample representative of the US 2020 population by age, sex, and race/ethnicity. Respondents answered questions assessing intersectional discrimination using the intersectional discrimination index (InDI). The InDi captures measures of

three forms of discrimination: anticipated, everyday, and major. Symptoms of insomnia were measured via the Sleep Condition Indicator. Descriptive and logistic regression analyses were performed.
Results: Among respondents (n= 4,966), insomnia symptoms were more prevalent among women (21.3%) vs men (14.0%), among those who identified as multi-racial or other (24.5%) vs other racial and ethnic groups (Asian/Pacific Islander, 10.4%; non-Hispanic Black 12.1%; Hispanic 17.9%; and non-Hispanic White, 18.5%. Across all three subscales of the InDI (e.g., anticipated, every day, and major discrimination), intersectional discrimination was a better predictor for insomnia than those without InDi. Across race-by-gender interactions, individuals who are both racial/ethnic and gender minorities did not endorse higher symptoms of insomnia. Individuals who are other/multi race and a sexual minoritized group (e.g. non-heterosexual) OR= 1.7 (C.I. 0.68-2.02) and experienced discrimination were likely to endorse symptoms of insomnia.
Conclusion: In this study individuals who reported any form of discrimination were more likely to report symptoms of insomnia. While race or sex alone (except among Asian American/Pacific Islanders) are not predictors of insomnia, experiences of discrimination do predict insomnia. Individuals who are sexual minorities and of other racial minority groups might endorse high symptoms of insomnia. This study suggests that more research is needed to understand the unique role of how discrimination might increase insomnia for persons who sit at the margins of oppression.
Support (if any):

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0259

SLEEP DURATION ASSOCIATED WITH PERCEIVED RACIAL DISCRIMINATION: DATA FROM 25 US STATES

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Introduction: Previous studies have shown sleep duration associated with racism, but few studies have examined population-level data and how these relationships differentiate across race/ethnicity groups.
Methods: Data from the 2022 Behavioral Risk Factor Surveillance System (BRFSS) was used. The BRFSS is a state-based population survey conducted annually by the CDC. In 2022, 25 states collected data on perceived discrimination (N=144.267), which was assessed with the question: "Within the past 12 months, do you feel that in general you were treated worse than, the same as, or better than people of other races?" As well as the same question regarding treatment at work and when seeking healthcare, and whether individuals experienced physical symptoms due to race-based treatment. Response options were Same (reference), Better, or Worse. Habitual sleep duration was categorized as <=4h, 5h, 6h, 7h (reference), 8h, 9h, and 10+h. Sleep-by-race/ethnicity interactions were explored. Models were adjusted for age, sex, education, and depression, and were population-weighted.
Results: Decreased likelihood of perceived better treatment was associated with <=4h, 5h, 6h, and 8h, increased likelihood of worse treatment was associated with <=4h, 5h, and 6h, and decreased likelihood was associated with 8h and 9h. Sleep-by-race/ethnicity interaction was significant (p< 0.0001). In stratified analyses, among Non-Hispanic Whites, insufficient and excessive sleep were both associated with perceived racism. Among Blacks/African-Americans, longer sleep duration was associated with perceived better treatment and insufficient sleep was associated with worse treatment. Among Hispanics/Latinos, 9h sleep was associated with perceived better treatment, but insufficient sleep was associated with worse treatment. Among Asians, worse treatment was associated with 10+h only. Among American Indians/Alaskan Natives, worse treatment was associated with all categories of insufficient sleep. Similar sleep-by-race/ethnicity interactions were found for treatment in work (p< 0.0001) and healthcare settings (p< 0.0001). Although no sleep-by-race/ethnicity interaction was found, physical symptoms due to treatment based on race was associated with <=4h (OR=2.28), 5h (OR=1.93), and 6h (OR=1.27).
Conclusion: Insufficient (and in some cases excessive) sleep duration is associated with increased perceived discrimination across groups and settings, though groups differ in terms of degree of impact. Insufficient sleep is also associated with increased physical symptoms due to racism.
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0260

SKIN TONE - A MARKER FOR BIAS KNOWN AS COLORISM - IN RELATION TO SLEEP HEALTH AMONG AFRICAN AMERICAN WOMEN

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Introduction: Colorism – or skin tone bias – likely impacts sleep health through activation of stress pathways in psychological response to trauma from colorist experiences and/or through differential access to health-promoting resources due to fewer educational/economic opportunities granted to darker- compared to lighter-skinned individuals. However, investigations of skin tone in relation to sleep are sparse.
Methods: We assessed associations between skin tone and sleep dimensions cross-sectionally (2010-2012) and longitudinally (until 2014-2018) among a cohort of 1,674 Black women aged 23-35 years residing in Detroit, MI at enrollment (2010 – 2012). Skin tone was measured objectively using a digital skin reflectance instrument and categorized as light [29.3–57.6] (25%), medium [57.7-72.4] (50%), and dark [72.5-106.1] (25%) brown. Self-reported sleep dimensions were dichotomized (yes vs no) as: short sleep duration (< 7 hours), non-restorative sleep (waking up feeling well-rested < 4 days/week), insomnia symptoms (difficulty falling or staying asleep 10+ days/month), and diagnosis of sleep apnea. Adjusting for age, we used Poisson regression with robust variance to estimate prevalence ratios (PRs) and 95% confidence intervals (CIs) and applied generalized estimating equations to determine risk ratios (RRs) and 95% CIs between skin tone and each sleep dimension, separately.
Results: At baseline, mean age was 28.7±3.4 years. Women with darker skin had the highest prevalence of short sleep (61.6% vs. 59.5% [medium] and 55.7% [light]) and comparable prevalence of non-restorative sleep (37.9% vs. 37.8% [medium]) and 37.2% [light] and sleep apnea (6% vs. 5.3% [medium] and 4.5% [light]). Women with light skin had the highest prevalence of insomnia

symptoms (21.1% vs. 17.7% [medium] and 15.6% [dark]). Women with dark vs. light skin had a marginally higher prevalence and risk of short sleep (PR=1.04 [95% CI:1.00-1.08] and RR=1.07 [95% CI:0.99-1.16]) and a lower prevalence of insomnia symptoms (PR=0.95 [95% CI:0.91-0.99]). Skin tone was not associated with the remaining sleep dimensions.
Conclusion: Sleep disturbances were prevalent, and dark- compared to light-brown skinned participants had a higher prevalence of short sleep duration but a lower prevalence of insomnia symptoms. Associations between dark skin tone and short sleep duration persisted over time. Future studies should identify structural and psychosocial contributors to inform interventions.
Support (if any):

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0261
THE SOCIAL DETERMINANTS OF SLEEP IN EMERGING ADULTHOOD

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Introduction: Emerging adults, especially Black college students, are at risk for poor sleep outcomes. Race and family support are crucial factors linked to sleep, yet lifestyle and health factors are frequently investigated in this population. We examined sleep quality as a mediator of the association between race-related stress and depression at varying levels of housing security and kinship support.
Methods: Black students attending a large predominantly White institute (n = 93, 86.02% female, Mage = 21.7 years, 41.9% low SES) reported on sleep quality, race-related experiences, family factors, and depression. A moderated mediation model was tested using methods established by Baron and Kenny (1986). Participants' sleep was assessed using the Pittsburgh Sleep Quality Index (Buysse et al., 1989). 86% of participants reported poor sleep based on the recommended cutoff (5 points) established by Buysse (1989), with a higher score indicating poorer sleep quality.
Results: Sleep partially mediated the association between race-related stress and depression. A significant association between race-related stress and depression was found in a simple mediation analysis (b=0.25, p< 0.001), however, the relationship between race-related stress and depression was non-significant (b=0.114, p=0.07) after introducing sleep as a mediator. Sleep was a significant predictor of depression (b=1.69, p< 0.001), and its inclusion significantly improved the model, explaining an additional 25 percent of the variance in depression (R^2=0.25, p< 0.001). Associations between race-related stress and sleep quality varied by the level of kinship support and housing security. The association of race-related stress with depression through sleep is significant for participants with low kinship support (b = .220, p < 0.001), but not for those with high kinship support (b=.056, p= .364). Similarly, the association of race-related stress with depression through sleep was significant for participants experiencing housing insecurity (b=.175, p < .001), but not for those experiencing housing security (b=.07, p = .211).
Conclusion: The conditional effects of kinship support and housing security emphasize the crucial role of social support in mitigating the adverse effects of racial stress on sleep. Our findings demonstrate the interplay of race, sleep, and adjustment, suggesting the importance of tailored interventions for promoting the well-being of Black college students.
Support (if any):

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0262
AWAKENING TO INEQUALITY: EXPLORING THE SOCIAL DETERMINANTS OF SLEEP HEALTH IN LOW-INCOME, BLACK AMERICANS

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Introduction: Sleep health is defined as a multidimensional pattern of sleep and wakefulness that is adapted to individual, societal, and environmental demands, and that fosters mental and physical well-being. Prior research demonstrates that social determinants, operating at the household, interpersonal, and community levels, associate with individual dimensions of sleep health (e.g., sleep duration), and may underlie racial disparities in such dimensions. However, scant research has investigated social determinants of multidimensional sleep health. The current study investigates cross-sectional associations between multi-level social determinants, including household food insecurity, interpersonal discrimination, and neighborhood social cohesion, safety and satisfaction, and multidimensional sleep health among a low-income, Black American community-based sample.
Methods: Participants included 530 Black American participants (82% female; mean age= 60.3) from two urban neighborhoods. Based on the Ru SATED construct, we constructed a composite Sleep Health (SH) score from the sum of scores representing "healthy" and "unhealthy" ranges of 6 sleep dimensions [i.e., regularity, satisfaction, alertness/ sleepiness, timing, efficiency and duration (Range = 0-6)]. Sleep dimensions were derived from actigraphy or self-reports. Food insecurity (range=0-3), interpersonal discrimination (range=0-21), and neighborhood cohesion, safety, and satisfaction (each with range=1-5) were measured via validated self-report surveys. Linear regression analyses examined the association between each social determinant and sleep health, after adjustment for age, sex, neighborhood, education, and body mass index.
Results: Greater food insecurity and greater interpersonal discrimination were associated with poorer sleep health scores (B=-.15; SE=.05 and B=-.03; SE=.01, respectively). In contrast, greater neighborhood safety and satisfaction were associated with better sleep health scores (B= .22; SE=.06 and B=.11; SE=.05, respectively). There was not a significant association between social cohesion and sleep health.
Conclusion: These findings demonstrate that determinants of sleep health go beyond the individual level, encompassing socio-environmental influences that may act as risk or protective factors. Our results suggest that both individual and policy-level interventions may be needed to mitigate pervasive and enduring sleep health disparities.
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0263
FOOD INSECURITY AFTER JOB LOSS IS ASSOCIATED WITH LOWER MULTIDIMENSIONAL SLEEP HEALTH OVER TIME

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Introduction: About 35 million people live in food insecure households creating substantial public health burden. While prior research supports the relationship between food insecurity and disturbed/curtailed sleep, most studies have employed cross-sectional designs and relied on surveys. This project sought to examine the longitudinal relationship between food insecurity and multidimensional sleep health in a group of individuals highly vulnerable to financial strain, participants with a recent history of involuntary job loss.
Methods: The ADAPT study is an observational, longitudinal study that assessed the negative health effects of involuntary job loss over the course of approximately 18 months (6 visits). A multidimensional sleep health composite (Ru-SATED) was calculated using raw actigraphy data, a daily sleep diary, and a sleep interview. Participants were classified as food insecure if they reported a score of 2-6 on the Household Food Security Scale within the first six months of job loss (first 2 visits).
Results: With robust control for socioeconomic status, food insecurity was associated with worse multidimensional sleep health across all timepoints (Estimate = -.43, SE = .18, 95% CI [-0.78, -0.08]). Food insecurity was associated with poor sleep quality (sleep diary; $p < .01$), worse sleep efficiency (actigraphy; $p < .01$), and later sleep timing (actigraphy; $p < .05$). Food insecurity was not associated with sleep duration (actigraphy) or sleep regularity (actigraphy).
Conclusion: Results suggest that individuals experiencing food insecurity six months after job loss had worse multidimensional sleep health that sustained over time. These findings extend the negative impact of food insecurity on self-reported sleep indices to multidimensional sleep health that incorporates subjective, objective, and interview measures. Future research is needed to assess whether increased accessibility to food after job loss could improve sleep health along with other health risks in this vulnerable population.
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0264
SLEEP DURATION AMONG SAMOAN CHILDREN: A DESCRIPTIVE STUDY OF BEHAVIORAL AND SOCIODEMOGRAPHIC CORRELATES

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Introduction: Sleep is important for child health and development and has been associated with obesity risk. Pacific Island nations have amongst the highest obesity prevalence globally, but little is known about child sleep in these settings. The study aimed to: 1) describe nighttime sleep duration and the proportion of children who met sleep recommendations between 2 and 9 years old, and 2) identify behavioral and sociodemographic correlates of sleep duration in Samoa.
Methods: This secondary analysis used three waves of data collected from the Ola Tuputupua'e ('Growing Up') cohort in Samoa between 2015 and 2020. Primary caregivers reported how many hours their child slept at night. Means and standard deviations were calculated for child sleep duration, while frequencies and proportions were calculated for meeting the World Health Organization age-based sleep recommendation (>11 hours for toddlers, >10 hours for preschool-age children, and >9 hours for school-age children. We ran multivariable regression models, stratified by age group to assess associations between child characteristics, sociodemographic characteristics, and zBMI, diet-, and activity-related factors with sleep duration across the waves. Mixed effects models were used to account for the fact that data was repeated within participants and allow for both time varying and time-invariant factors.
Results: Average nighttime sleep duration was 9.7 (1.1) for toddlers, 9.5 (1.0) for preschoolers, and 9.4 (1.3) for school-age children. Based on nighttime sleep duration, approximately 86% of toddlers did not meet their age-specific sleep recommendation, compared to 51% of preschoolers and 23% of school-age children. Living in a lower income household was associated with more sleep (β: 0.57 [95% CI: 0.29, 0.86]) compared to living in a higher income household, while having a primary caregiver who did not complete high school (β: -0.62 [95% CI: -0.88, -0.36]) was associated with less sleep. Increased total carbohydrate intake (β: -0.19 [95% CI: -0.33, 0.00]) and greater adherence to a neotraditional dietary pattern (β: -0.14 [95% CI: -0.24, -0.05]) were associated with shorter sleep.
Conclusion: Interventions focusing on early childhood sleep may be needed in Samoa. However, further investigations accounting for daytime sleep are needed and research to inform intervention components.
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0265
DISPARITIES IN BED AND WAKE TIMES IN THE US POPULATION ASSOCIATED WITH TYPICAL WORK HOURS

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Introduction: Racial and ethnic minority populations are at an increased risk of having shorter sleep duration and poorer sleep quality. This nationally-representative study examines whether groups differ on their typical sleep opportunity window, and whether this depends on typical work hours.
Methods: Data were obtained from adults who participated in the National Health And Nutrition Examination Survey (NHANES), overseen by the CDC, for the 2017-2018 and 2019-2020 (March, pre-pandemic) waves. These data were combined and weighted using NHANES sample weights. Habitual sleep timing was assessed as self-reported typical bedtime and wake time, which was converted to minutes from midnight. Race/ethnicity was self-reported as non-Hispanic White, Black/African-American, Mexican-American, Other Latinx, Asian, or Multiracial/Other. Work time was categorized as None, 20 or fewer hours, 21-39 hours, 40 hours (reference), 41-59 hours, or 60 or more hours. Covariates included demographics (age, sex) and socioeconomics (education, income-poverty ratio).
Results: Overall, compared to Non-Hispanic Whites, Blacks/African-Americans went to bed 14 minutes later, Mexican Americans went to bed 18 minutes earlier and got out of bed 33 minutes earlier, and Asians went to bed 13 minutes later and woke up 16 minutes later. And compared to those who worked

40 hours, those who worked less than 40 hours went to bed later and woke up later, and those who worked 60+ hours went to bed later. There was a significant race/ethnicity by work hours interaction. The relationship between race/ethnicity and sleep timing differed depending on which work hours category respondents were in. Overall, Black-White differences in bedtime were seen in those who worked 41-59 hours. Mexican-White differences in bedtime were seen for non-working and 40 hours and for waketime were seen for all <=40 hours groups. Asian-White differences were seen for bedtime for 41-59 hours and for waketime in non-working, 40 hours, and 60+ hours. Multiracial-White differences were seen for bedtime in non-working 21-39 hours, and for waketime in 21-39 hours.
Conclusion: Even after accounting for other elements of sleep, Blacks/African-Americans, and Asians still exhibit delayed sleep. Future research is required to further explore disparities in circadian rhythm and culturally targeted interventions for sleep health.
Support (if any):

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0266
SLEEP ATTITUDES IN ADOLESCENTS: DEMOGRAPHIC DIFFERENCES AND ASSOCIATIONS WITH SLEEP HEALTH

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Introduction: Between 70-90% of teenagers in the United States sleep fewer than the minimum recommendation of 8 hours per night, which can result in a number of downstream physical and psychological consequences. Prior studies show there are individual differences in how adults prioritize and think about the benefits of adequate sleep, which in turn predicts sleep behaviors and sleep health. However, research is lacking on sleep attitudes in adolescents and how these attitudes may relate to sleep behaviors.
Methods: Participants included 649 adolescents from across the United States (ages 13-18 years; 79.7% female; 45.2% white) who completed an online survey to assess sociodemographics, sleep attitudes using the Charlotte Attitudes Towards Sleep Scale, and their sleep using the Pittsburgh Sleep Quality Index, Sleep Timing Questionnaire, and the Adolescent Sleep Hygiene Scale.
Results: Non-white participants were more likely to report more positive sleep attitudes compared to white participants ($t(414) = -2.18$, $p = .03$). A series of regression models were conducted to examine whether sleep attitudes predicted sleep, while adjusting for sociodemographics (age, gender, race/ethnicity, SES). Adolescents who reported more positive attitudes towards sleep also reported longer sleep duration ($\beta = -.47$, $SE = .06$, $p < .001$), better sleep quality ($\beta = -.36$, $SE = .2$, $p < .001$), shorter sleep onset latency ($\beta = -.22$, $SE = .06$, $p < .001$), earlier weekday ($\beta = -.33$, $SE = 364.67$, $p < .001$) and weekend ($\beta = -.33$, $SE = 348.87$, $p < .001$) bedtimes, and better sleep hygiene ($\beta = .26$, $SE = .03$, $p < .001$). There were no significant differences in sleep attitudes based on race, ethnicity, gender, or SES when adjusting for other demographic characteristics.
Conclusion: This study fills an important gap in the research on adolescent sleep by examining how sleep attitudes may contribute to sleep health. Prior research on health attitudes suggest that attitudes are modifiable, and findings from this study advance research on adolescent sleep and suggests that sleep attitudes may be an important target to minimize sleep health difficulties when developing and adapting sleep interventions.
Support (if any):

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0267
ROTC CADETS' SLEEP QUALITY VARIES AS A FUNCTION OF PRIOR STRESSFUL EXPERIENCES

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Introduction: Sleep difficulties and stress are common among U.S. Army Soldiers – especially among those who have been exposed to traumatic events. In the short term, elevated stress can reduce sleep quality, alter circadian rhythms, and disrupt normal metabolism and endocrine functions. Because ROTC cadets are new to the Army, their level of exposure to operationally stressful experiences is relatively low. Understanding the extent to which stress impacts sleep at this point in their military careers can help ROTC cadets be better prepared for later exposure to stressors in military operational contexts. In the present study, the impact of stress on sleep quality of ROTC cadets was investigated.
Methods: Participants included 519 ROTC cadets at the annual Cadet Summer Training Advanced camp with a mean age of 22.24 ± 2.788 years (M ± SD). Participants completed the Pittsburgh Sleep Quality Index (PSQI), with scores ranging from "1" (good) to "4" (bad). They also completed the Post Traumatic Stress Disorder Checklist – Military Version; PCL-4, which measures prior exposure to stressful life events. This version of the PCL includes only four questions, with responses indicated on a 30-point rating scale, with "1" connoting less stressful and "30" connoting more stressful life events.
Results: Cadets' self-reported sleep quality scores averaged 2.1 ± .618 (M ± SD). Cadets reported an average PCL-4 score of 5.58 ± 2.606 (M ± SD). Quality of sleep and stressful life events were significantly negatively correlated, $r = -.303$, $p < .01$.
Conclusion: Greater prior exposure to stressful life events is associated with poorer subjective sleep quality. Cadet training is intense and stressful. Early identification of those cadets who are especially susceptible to stress-induced sleep disturbance is a necessary first step toward development of targeted interventions to improve the performance, health, and likelihood of success of such individuals during military training.
Support (if any): Support for this study came from the Military Operational Medicine Research Program (MOMRP) of the United States Army Medical search and Development Command (USAMRDC).

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0268
SLEEP DURATION ASSOCIATED WITH COGNITIVE DECLINE: INFLUENCE OF AGE AND RACE/ETHNICITY

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Introduction: Insufficient and excessive sleep are associated with cognitive dysfunction in older adults. Limited studies are

available for adults < 50 years of age and the influence of race/ethnicity in a nationally representative population. We investigated the association between sleep duration and cognitive decline and the influence of age and race/ethnicity, in U.S adults >40 years of age.
Methods: Data from the 2022 Behavioral Risk Factor Surveillance System (BRFSS) was used. Twelve states collected data on cognitive decline, assessed with: "During the past 12 months, have you experienced confusion or memory loss that is happening more often or is getting worse?" among individuals aged 40 or older (N=63,948). Population-weighted logistic regression analyses examined this in relation to self-reported habitual sleep duration in models that also included age (by decade), sex, race/ethnicity, education, and depression history.
Results: In adjusted analyses, increased likelihood of perceived cognitive decline was seen for ≤4h (OR=2.50), 5h (OR=2.06), 6h (OR=1.51), 9h (OR=1.34), and 10+hr (OR=2.15), compared to 7h. A 3-way interaction was found (p=0.0001), as well as a 2-way interaction for sleep-by-age (p< 0.0001) but not sleep-by-race (p=0.16). There was an age gradient, such that for participants in their 40s, short sleep duration was more strongly associated with cognitive decline, and as age increased, these relationships generally weakened. However, a sleep-by-race interaction was seen for older adults only, where the relationship between cognitive decline and both short and long sleep duration was stronger among Blacks/African-Americans compared to Non-Hispanic Whites. Further, secondary analyses among those who reported cognitive decline showed that those with ≤4h sleep duration were more likely to talk about it with a doctor (OR=1.67), and greater ordinal likelihood of cognitive decline interfering with social functioning was associated with both short and long sleep duration.
Conclusion: Sleep duration is related to cognitive decline and its social effects, though this depends on age and race/ethnicity, especially among older adults. Interventions should focus on effects of insufficient sleep in younger populations in general, and older Black/African-American groups.
Support (if any):

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0269

ASSOCIATIONS BETWEEN SLEEP-RELATED IMPAIRMENT AND ANXIETY LEVELS AMONG THE LATINO/A POPULATION IN FLORIDA

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Introduction: In the Hispanic community, sleep impairment and the prevalence of anxiety represent pressing concerns. Sleep quality and patterns can be significantly affected by anxiety-related symptoms and disorders. Conversely, insufficient or disrupted sleep can worsen anxiety symptoms, creating a complex interplay. While chronic sleep disorders affect a substantial portion of the American population, including Hispanics, research addressing these complex issues within this specific demographic remains limited. This study seeks to illuminate the relationship between anxiety and sleep impairment among Hispanics in Florida, aiming to provide valuable insights into these critical health aspects.
Methods: Data were collected from the NIH-funded study DORMIR. DORMIR is a remote health monitoring study designed to identify behavioral, genetic, psychosocial, and environmental factors linked to insufficient sleep and their relationship to cardiovascular health within the Latino/a population. Latino/a adults 18+ years old (N=317, 67.8% female, ages 37.9±15.0 years) completed several surveys including the PROMIS Sleep Related Impairment (SRI) and PROMIS Emotional Distress - Anxiety measures. Linear regression analysis was performed with age, sex, income, and body mass index (BMI) as covariates to determine the impact of anxiety on sleep-related impairment.
Results: The average SRI score was 8.34±3.63, while the mean Emotional Distress - Anxiety score was 18.0±7.46. Anxiety [F (5,311) = 15.6, β1=0.366, p < 0.001], income [F (5,311) = 15.6, β1= - 0.165], p=0.003], and BMI [F (5,311) = 15.6, β1=0.113, p =0.030] all independently predicted sleep-related impairment, while adjusting for covariates. Anxiety levels and BMI scores were positively associated with sleep-related impairment, while income was negatively associated with sleep-related impairment among Latino/a adults.
Conclusion: This study shows that higher levels of anxiety, increased BMI scores, and lower income are linked to increased sleep impairment in Latino/a individuals. Additional research is required to examine whether external factors may act as confounding variables in this correlation. Such investigations would enable the development of tailored solutions aimed at mitigating both poor sleep health and emotional distress. These findings underscore the critical need for targeted interventions to address the impact of poor sleep on the health of the Latino/a population.
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0270

RACIAL/ETHNIC SLEEP HEALTH RELATED TO MENTAL HEALTH: DATA FROM THE NATIONAL SLEEP FOUNDATION SLEEP IN AMERICA POLL

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Introduction: Sleep disparities are well-documented in the population. Rarely are multiple dimensions of sleep experience evaluated on a national level, however. Even more novel is the implication that these differences are partially explained by mental health disparities.
Methods: Data from the Sleep In America Poll included a population-level sample of US adults. N=1042 adults provided complete data. Sleep health metrics included weekday and weekend bedtime and waketime, time in bed, and sleep duration, perceived sleep need, sleep debt (sleep need – duration), and days/week of: feeling well-rested, difficulty falling asleep, difficulty staying asleep, sleep impacting daytime function, daytime sleepiness, and taking sleep medication. Covariates included age, sex, education, household income, and PHQ9 depression score

(without the sleep item). Linear regression analyses examined sleep variable as dependent variable and race/ethnicity (Non-Hispanic White, Black/African-American, Hispanic/Latino or Asian/Other) as independent variable, adjusted for covariates. Secondary analyses examined race/ethnicity-by-depression interactions.
Results: In population-weighted, adjusted analyses, compared to non-Hispanic Whites, Blacks/African-Americans reported 0.78hr delayed weekend waketime (95%CI: 0.14,1.43) an additional 0.49 days/week of daytime sleepiness (95%CI: 0.05,0.93), 0.47 fewer days/week taking sleeping medications (95%CI: -0.80,-0.14), 0.41hr perceived sleep need (95%CI: -0.74,-0.10), and 0.51hr weekday less sleep duration (95%CI: -0.87,-0.15). Hispanics/Latinos reported 1.05 days/week difficulty staying asleep (95%CI: -1.42,-0.67) and 0.38 fewer days/week taking sleep medications (95%CI: -0.70,-0.07). Asians/others reported 0.73 fewer days/week with trouble staying asleep (95%CI: -1.26,-0.19) and 0.51 fewer days/week taking sleep medications. Significant group-by-depression interactions were seen for weekday and weekend bedtime, weekday time in bed, days/week well rested, perceived sleep need, weekday sleep duration, and sleep debt. Stratified analyses showed that Blacks/African Americans and Asians/Others especially reported worse sleep health in the presence of higher depression scores, compared to Non-Hispanic Whites.
Conclusion: Several dimensions of sleep health were disproportionately experienced across race/ethnicity groups in the US. In particular, worse sleep health in Blacks/African-Americans and Asians/Others was further impacted by depression symptoms. Future work should further explore the role of mental health disparities in sleep health and mental health interventions may reduce sleep disparities.
Support (if any):

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0271

HETEROGENEITIES IN SLEEP OUTCOMES AMONG U.S. IMMIGRANTS FROM DIFFERENT RACIAL AND ETHNIC BACKGROUNDS

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Introduction: Sleep plays an essential role in overall health and well-being. Although U.S. immigrants are considerably growing, few studies have examined sleep in this diverse population, particularly those from Asian backgrounds. It is also unclear how sleep differs by the length of residence (LOR) across immigrant groups. Using a nationally representative sample of U.S. immigrants, this study sought to address three questions: 1) Do sleep outcomes differ across racial/ethnic groups? 2) Is there an association between LOR and sleep outcomes? and 3) Does LOR moderate the association between race/ethnicity and sleep outcomes?
Methods: Data were pooled from the 2013-2018 National Health Interview Survey. The sample (N = 27,761; 14% ≥ 65 years old) included foreign-born adults from six racial/ethnic groups: non-Hispanic (NH) White, NH Black, NH Asian (Chinese, Filipino, Asian Indian), and Hispanic/Latino. LOR was categorized as < 5, 5-9, 10-14, and ≥15 years. Sleep outcomes included self-reported sleep duration (short < 7, normal 7-8, and long ≥ 9 hours) and sleep quality (trouble falling asleep, trouble staying asleep, and waking up feeling unrested).
Results: Over one-third of the sample reported either short or long sleep duration. The prevalence of poor sleep quality ranged from 15.6 to 40.2% among racial/ethnic groups. Compared to NH Whites, Filipinos (odds ratio [OR]=1.91, 95% confidence interval [CI]: 1.60-2.28), NH Blacks (OR=1.84, 95%CI: 1.58-2.15), and Hispanics/Latinos (OR=1.15, 95%CI: 1.03-1.29) were more likely to report short sleep, while Asian Indians were less likely to experience poor sleep quality ($p < 0.05$). Immigrants with LOR ≥ 15 years exhibited significantly worse sleep outcomes in comparison to those with LOR < 5 years, and LOR ≥ 15 years moderated White-Asian differences in sleep quality. Additionally, different immigrant groups showed variations in sleep patterns as they resided longer in the U.S.
Conclusion: Immigrants from different racial/ethnic backgrounds exhibited substantial heterogeneities in sleep outcomes. Future research should investigate the factors contributing to the variations in sleep patterns, both between racial/ethnic groups and within the same group of immigrants. More importantly, routine sleep assessments should be conducted for this population to promptly identify sleep problems and initiate tailored interventions.
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0272

ASSOCIATIONS BETWEEN SLEEP ARCHITECTURE, APPETITE AND FOOD REWARD OVER 6 MONTHS IN BLACK EMERGING ADULTS

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Introduction: Short sleep duration is associated with increased feelings of appetite and food reward, though few studies have assessed associations between sleep architecture with appetite and food reward measures. Additionally, no data exists on these measures in Black emerging adults (ages 18-28 years old), despite higher risks of poor sleep and obesity in this population. This analysis aims to examine relationships between sleep architecture with appetite and food reward over 6 months in Black emerging adults.
Methods: In a repeated measures design, 15 Black emerging adults (12 females; age, 21±2.4 years; height, 168±11.1 cm; weight, 72.4±12.6 kg; body fat, 25.8±11.9%) completed a baseline (BLN) and 6-month follow-up (6MO) visit. In-home sleep over 2 nights was measured with polysomnography. Outcome measures included fasting and post-standard breakfast appetite sensations over 180 minutes (desire to eat, hunger, fullness, and prospective food consumption; visual analogue scales) and food reward (implicit wanting, explicit liking and explicit wanting; Leeds Food Preference Questionnaire). Linear mixed models using a restricted maximum likelihood estimation with a Kenward-Roger correction for small samples were used to assess associations between sleep stage duration (minutes of stage 2, slow-wave sleep (SWS) and rapid eye movement (REM) sleep) with fasting appetite sensations, post-meal appetite area under the curve (AUC) and food reward measures. Covariates included time (BLN vs. 6MO) and body weight. Participant ID was used as a grouping variable.
Results: No significant associations were noted between sleep stage duration with fasting appetite sensations and post-breakfast

appetite AUC. Lower stage 2 sleep duration was associated with greater explicit wanting (β= -0.13, 95%CI [-0.23, -0.04], p=0.01) and explicit liking (β= -0.19, 95%CI [-0.28, -0.11], p< 0.0001) for sweet relative to savory foods.
Conclusion: These findings suggest that habitual, in-home measures of sleep stage duration are not associated with appetite sensations in Black emerging adults. However, greater explicit wanting and liking for sweet relative to savory foods in response to lower stage 2 sleep duration may be a mechanism by which short sleep duration leads to an increased risk of positive energy balance and obesity over time.
Support (if any):

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0273
PHOTOVOICE FOR LEVERAGING INTEGRATIVE MEDICINE AMONGST BLACK ADULTS TO IMPROVE SLEEP HEALTH

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Introduction: Average adults are recommended to have 7-8 hours of sleep. However insufficient sleep (IS; < 7 hours/nightly) is associated with increased risk of chronic diseases such as cardiovascular disease (CVD) and type 2 diabetes mellitus (T2DM). Integrative medicine, a burgeoning area of research and practice, leverages both modern and traditional approaches to improve health. Despite integrative medicine's recognition as a tool to improve sleep and related outcomes, there is a gap in literature in addressing its impact among blacks, who experience a disproportionate burden of IS and chronic disease. This qualitative study aimed to examine current integrative medicine practices to overcome IS and overall health in black communities.
Methods: Using photovoice methodology, a qualitative tool which applies community-engaged principles to produce culturally informed results through interviews and digital media, consented participants were recruited from Miami, Florida and 1) instructed to capture images over one week that communicated their integrative practices to improve sleep and overall health on their mobile device; 2) interviewed using individual, semi-structured procedures to add "voice" to the "photos" they captured for ~20 minutes; and 3) invited to participate in follow-up focus groups for refined discussion and data triangulation for ~1.5 hours. Both individual and focus group interviews were conducted over Zoom with recordings transcribed for formal content analysis using Nvivo software.
Results: The sample included N=25 diverse US blacks (M=37, SD=13, range 21-57). Approximately a quarter of the sample were unemployed (N=7) and majority were women (N=21). Results highlighted five themes of integrative medicine practice including: (1) natural wellness (sleep supplements, comfort beverages, aromatherapy, herbalism, outdoors); (2) self-care (self-maintenance, physical activity, spatial comfort); (3) leisure (pet support, play); (4) mental stimulation (mindfulness, reading); and (5) spiritual wellness (faith-based practices). Study results elucidate the heterogeneity of diverse US blacks regarding sociocultural knowledge, beliefs, and behaviors.
Conclusion: Addressing IS in black communities requires a comprehensive strategy that integrates cultural sensitivity, family and community dynamics, education, mental health support, and informed policymaking. Future studies should consider how sleep health literacy, stress appraisal, and coping strategies may vary by race/ethnicity for tailored intervention.
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0274
ASSOCIATIONS BETWEEN SLEEP ARCHITECTURE AND ENERGY BALANCE IN BLACK EMERGING ADULTS

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Introduction: Body weight is determined by sustained changes in energy balance (EB), reflecting the difference between energy intake (EI) and energy expenditure (EE). Insufficient sleep negatively impacts EB to favor weight gain. Black emerging adults have a higher risk for insufficient sleep and obesity, but little data exists on these measures in this population. This analysis aims to examine relationships between sleep architecture with parameters of energy balance (EI and EE) in Black emerging adults.
Methods: In a repeated measures design, 15 Black emerging adults (12 females; age, 21±2.5 years; height, 168±11.1 cm; body mass, 72.4±12.6 kg; body fat, 25.8±11.9%) completed an initial (BLN) and 6-month follow-up (6MO) visit. In-home sleep over 2 nights was captured with polysomnography. Physical activity EE (PAEE) and moderate-to-vigorous physical activity (MVPA) were measured over seven days via actigraphy and calculated using the Freedson VM3 Combination and Freedson (1998) algorithms, respectively. Resting metabolic rate (RMR) and thermic effect of food were measured via indirect calorimetry. Ad libitum EI was measured using 3 days of provided meals. Spearman's Rank correlations assessed relationships between changes in sleep measures (minutes and percentage of stage 2, slow wave sleep (SWS), and REM) with changes in parameters of EB. Linear mixed models assessed relationships between sleep variables and EB variables, with participant ID as a grouping variable and body weight as a covariate.
Results: There were no significant associations between changes in sleep architecture with changes in EB variables. SWS duration was positively related to EI (Beta = 9.11, 95%CI [0.486, 17.734], p = 0.049). RMR was inversely related to stage 2 percentage (Beta = -63.3, 95%CI [-101.48, -25.12], p < 0.01), SWS percentage (Beta = -52.63, SE: 18.85, p = 0.01), and REM percentage (Beta = -55.36, 95%CI [-92.84, -17.88], p = 0.01).
Conclusion: These results suggest that greater SWS duration was related to higher EI, and that relative time spent in stage 2 sleep, SWS, and REM sleep were inversely related to RMR. Therefore, habitual measures of sleep architecture may impact obesity risk via modifications in EB parameters in Black emerging adults.
Support (if any):

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0275
ASSOCIATIONS BETWEEN SLEEP ARCHITECTURE, CORTISOL, AND BODY COMPOSITION OVER 6 MONTHS IN BLACK EMERGING ADULTS

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Introduction: Cortisol awakening response (CAR), diurnal slope (DS), and total daily output (TDO) are metrics of the hormone, cortisol. Emerging adults (ages 18-28 years old) experience poor sleep, which is linked to a blunted CAR, flatter DS, and obesity risk. Little data exists on these measures in Black emerging adults, despite higher risks of poor sleep and obesity. This analysis aims to examine relationships between sleep architecture, cortisol metrics, and body mass and composition changes over 6 months in Black emerging adults.
Methods: In a repeated measures design, 14 Black emerging adults (12 females; age, 21±2.5 years; height, 166±9.3 cm; body mass, 73.0±12.9 kg; body fat, 27.4±10.8%) completed an initial (BLN) and 6-month follow-up (6MO) visit. In-home sleep over 2 nights was captured with polysomnography. Salivary cortisol was collected at wake, 30-, 45-min post-wake, 12pm, and 7pm on 2 days. CAR area under the curve (AUC) was calculated with the wake, 30-, and 45-min post-wake samples with respect to wake (AUCi) and to ground (AUCg). DS was calculated as the slope using wake, 12pm, and 7pm samples. TDO AUC was calculated using all samples with respect to ground. Body mass and composition were assessed with BodPod. Paired t-tests evaluated differences in all variables between BLN and 6MO. Pearson correlations assessed relationships between sleep stage duration, cortisol metrics, and body mass and composition at each timepoint, and 6-month changes in these variables.
Results: There was an increase in body mass (MD: 2.7 kg, 95%CI [1.0, 4.4], p< 0.01), but not fat mass (p>0.05). REM sleep duration was positively associated with TDO at BLN (r = 0.57, p=0.03) but not at 6MO. REM sleep duration at BLN was also positively associated with 6-month changes in body mass (r=0.55; p=0.03). Greater increases in slow-wave sleep (SWS) duration were associated with a more positive DS (r = 0.73; p< 0.01).
Conclusion: These results suggest that greater amounts of REM sleep are associated with greater cortisol output and body weight changes, whereas greater amounts of SWS are associated with better DS profiles.
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0276

SEX INFLUENCES THE RELATIONSHIP BETWEEN SLEEP-RELATED IMPAIRMENT SCORE AND BLOOD CHLORIDE AMONG BLACKS

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Introduction: Sleep inefficiency is associated with increased risk of cardiovascular disease (CVD) and kidney disease. CVD and kidney disease have a bidirectional relationship, with one enhancing the disease progression of the other, and sharing biomarkers of inflammation and infection such as blood urea nitrogen (BUN) and chloride, respectively. Although Blacks have disproportionately higher rates of sleep inefficiency associated with cardiovascular, kidney, and inflammatory disease, data is limited concerning whether sleep-related impairment (SRI) is associated with these disease biomarkers, and sex in Blacks. This study investigated the association between SRI, sex and biomarkers of cardiometabolic, kidney and inflammatory disease including chloride and BUN within Blacks.
Methods: Data were extracted from 104 Blacks, aged 36 to 73 years, who were enrolled in two NIH-funded community-based sleep studies, ESSENTIAL and MOSAIC, from January 2020 until October 2023. Of the participants, 34.6% (n=36) were male and 65.4% (n=68) were female. The PROMIS Sleep-Related Impairment (SRI) 8a short form questionnaire was completed by all participants to determine subjective sleep efficiency. An independent t-test and multilinear regression analysis were conducted to explore associations between sleep-related impairment scores, chloride, BUN, and sex. Interaction effects between SRI score and potential moderators (sex, chloride and BUN) were conducted to examine which variables displayed a significant effect on SRI score.
Results: Black women reported higher sleep inefficiency compared to men (t(77.67) =-2.3, p ≤ 0.023). Controlling for age and sex, linear regression analysis showed that significant variables associated with (SRI) among participants were blood chloride (p ≤ 0.016) and sex (p ≤ 0.012). A moderation analysis showed a significant relationship between blood urea nitrogen, blood chloride and sex (p = 0.003), and that sex influences the relationship between SRI score and blood chloride. Regression analysis showed that all variables are significant predictors of SRI score.
Conclusion: The association of SRI to chloride, and its moderation by sex, with women scoring higher than males, suggests further investigations should be performed to analyze how these associations play a role in accounting for greater sleep inefficiency and CVD in Black women as compared to Black men.
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0277

ROBUST IDENTIFICATION OF SLEEP STATES AND THEIR TRANSITIONS USING WHOLE-NIGHT FMRI DATA

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Introduction: Polysomnography (PSG)-based sleep staging has a relatively poor (30s) temporal resolution, and as a result does not capture any sleep structure that may exist on finer time-scales. For example, brain activity patterns involved with transitions or changes within and between classical sleep stages are not captured. Here we used whole-night functional magnetic resonance imaging (fMRI) to address this shortcoming.
Methods: Data acquisition was conducted as part of a well-controlled sleep experiment with two consecutive nights of concurrent fMRI-EEG recording from 23:00 to 7:00. Twelve participants (18-35 years old, 8 females) had at least one complete sleep cycle during both Night 1 and 2. We analyzed the fMRI data using an unsupervised learning approach - Hidden Markov Model (HMM) to reveal recurrent structure ("states"). The HMM, applied to Night 2 data, encompassed 21 whole-brain states based on various model evaluation indexes. Each state was characterized as a multivariate Gaussian distribution including a mean fMRI activation distribution,a functional connectivity (FC) matrix, and a transition probability matrix.
Results: Modular analysis of the extracted transition probability matrix (between each pair of states) revealed five modules, each containing a set of states that had similar preferences to occur during a specific sleep stage or part thereof. Remarkably, the trained HMM predicted brain sleep states during Night 1 that had highly similar sleep stage preference ($r = 0.94$, $p < 0.001$). In Wake-related HMM states, the FCs between DMN and Salience Network (SAL) / Control Network (CON) were negative, while during N3-related HMM states, these FCs were positive. Similar patterns were found for mean fMRI activation.
Conclusion: These observations suggest that HMM may provide valuable information about sleep-state-specific brain activity patterns that extend well beyond the information provided by classical sleep staging. For example, cursory inspection of the HMM results suggests a subdivision of N2 in two groups of multiple states with different transition probabilities to Wake; analysis of brain activation and FC patterns of HMM states indicated that the connections between DMN and SAL/CON may play a critical role in the transition from wake to light sleep and, to deep sleep.
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0278

SEXUAL DIMORPHISMS IN SLEEP-DISORDERED BREATHING OF C57BL/6J MICE

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Introduction: Differences in sleep-disordered breathing (SDB) between biological sexes have been extensively reported. Prevalence of SDB is increased in men, but women appear to be more symptomatic at lower SDB severity, exhibiting more daytime sleepiness and insomnia symptoms. However, the mechanisms associated with sex differences in SDB remain unclear. We examined the differences in the sleep architecture and breathing during sleep between male and female mice with the same genetic background. We also analyzed whether ovariectomy abolishes the sex differences in SDB. We hypothesized that differences in sleep and SDB between male and female mice are attributed to different chemoreflex responses to carbon dioxide (CO2).
Methods: Mice were instrumented with EEG/EMG electrodes. Full-polysomnographies were performed in 16 males and 18 females C57BL/6J mice inside a whole-body plethysmography chamber. Poincaré plots of minute ventilation were used to assessed breathing stability during sleep. Mice were exposed to acute episodes of hypercapnia (8% CO2) and hypoxia (10% O2 + 3% CO2) during wakefulness and NREM sleep to measure the hypercapnic ventilatory response (HCVR) and hypoxic ventilatory response (HVR), respectively. Females underwent bilateral ovariectomy and the studies were repeated after 2 weeks.
Results: Sleep fragmentation was 55% increased in female mice compared to males. Unexpectedly, apnea index and breathing instability during sleep were significantly higher in female mice compared to males. HVR was similar between sexes. CO2 sensitivity positively correlated with apnea index ($r=0.55$, $P=0.05$). HCVR was significantly augmented in females during wakefulness and NREM sleep, which was attenuated by ovariectomy.
Conclusion: Our findings have shown different phenotypes of SDB between sexes in C57BL/6J mice. SDB in female mice is associated with a hyperarousal state and augmented CO2 sensitivity, which could be related to ovarian hormones.
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0279

INTERMITTENT ANALYSIS OF OBSTRUCTIVE SLEEP APNEA DYNAMICS

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Introduction: The intermittent nature of obstructive sleep apnea's (OSA) pathophysiological processes is characterized by unpredictable fluctuations among OSA endotypes and phenotypes, reflecting the complex dynamics underlying this sleep disorder. It is challenging to character such intermittent behaviors.
Methods: We developed an enhanced version of Koopman spectral analysis, tailored to be robust against noise, a common issue in physiological data, to investigate the nonlinear intermittent behaviors in OSA. Our analysis dissects the complex, nonlinear physiological patterns of Heart Rate Variability (HRV) features, aiming to understand better the cardiorespiratory dynamic nature of OSA and its severity, as indicated by the apnea-hypopnea index (AHI). Utilizing the Apnea-ECG Database from Physionet.org, which includes records from 70 OSA patients with OSA annotation, we validated the model in the ability to characterize the intermittency behavior of the HRV features and the accuracy of using these features to detect OSA.
Results: The results demonstrate that the noise-robust Koopman spectral analysis effectively identifies key dynamical features

in the pathophysiology of OSA. It revealed several previously unrecognized patterns and correlations in the data, offering more profound insights into the intermittent dynamics of OSA. The method showed high accuracy in distinguishing critical transitions between different severity levels of OSA.
Conclusion: The study successfully validates the efficacy of the noise-robust Koopman spectral analysis in analyzing complex systems like OSA. This approach provides an effective tool for understanding the intricate dynamics of pathophysiological processes, offering the potential for both diagnostic advancements and a better understanding of the underlying mechanisms of OSA.
Support (if any): Huynh, P. K., Setty, A. R., Le, T. B., & Le, T. Q. (2023). A noise-robust Koopman spectral analysis of an intermittent dynamics method for complex systems: a case study in pathophysiological processes of obstructive sleep apnea. IISE Transactions on Healthcare Systems Engineering, 13(2), 101-116.

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0280
EFFECT OF DAILY TRANSCUTANEOUS VAGAL NERVE STIMULATION ON OBJECTIVE AND SUBJECTIVE SLEEP FEATURES IN HEALTHY ADULTS

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Introduction: One key pathway through which the autonomic nervous system modulates sleep is via the vagus nerve. No study to date has examined the impact of daily vagal modulation on nightly sleep activity. Here, in a two-week, within-subject sham-controlled and counterbalanced study, we investigated the impact of daily, non-invasive vagal nerve stimulation on subjective and objective sleep features.
Methods: The Institutional Review Board of the University of Kentucky approved experimental procedures. Twenty healthy adults, aged between 18-65, were given ambulatory vagal nerve stimulators to wear at home for one week of active and one week of sham stimulation. Stimulation conditions were counterbalanced across participants. The device was worn for 15 minutes between 9 PM-11 PM each day before bedtime. Before and after sleep, participants completed the Karolinska Sleepiness Scale (KSS) to measure subjective sleepiness and completed daily diaries to gather subjective sleep outcomes. Participants also wore wrist actigraphs to objectively characterize behavioral sleep/wake patterns. Linear mixed effect models assessed the effect of tVNS on subjective and objective measures of sleep.
Results: tVNS had a significant impact on actigraphy indices of sleep behavior. Compared to sham stimulation nights, there was a significant reduction in wake after sleep onset (b=-17.12, p=.004), a significant improvement in amount of time spent asleep during the night (b=2.87, p=.01) and higher sleep efficiencies (b = 2.05, p=.01) on stimulation nights. No significant differences were found in KSS ratings before and after sleep or in subjective sleep assessments measured with daily diaries.
Conclusion: The results suggest that the use of daily tVNS may improve behavioral indices of sleep, highlighting the important role that autonomic activity may play in regulating nighttime sleep/wake function. Future studies should examine tVNS impacts on polysomnographically-measured sleep
Support (if any):

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0281
MORTALITY AND CARDIOVASCULAR CHANGES IN A MURINE MODEL OF OSA: AGING AND 22 MONTHS OF INTERMITTENT HYPOXIA

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Introduction: Obstructive sleep apnea (OSA) is a prevalent condition marked by intermittent hypoxia (IH), which significantly elevates the risk of cardiovascular disease (CVD) and overall mortality. Furthermore, aging is a widely acknowledged risk factor for the onset and progression of CVD. In this pioneering study, we aim to elucidate the interplay between 22 months of IH exposures and age-related factors by delineating their combined influence on a spectrum of cardiovascular parameters.
Methods: Male C57Bl/6J mice (n=19-23) were exposed to IH (cycles of FiO2 21% 90 s-6% 90s or room air (RA; 21%) for 12 hours/day during the light period) for 22 months. Mean arterial blood pressure (MBP) was assessed using tail-cuff method, while aortic peak velocity (indicator of systolic function), E/A ratio (indicator of diastolic function), coronary flow velocity reserve (CFVR), and pulse wave velocity (PWV) were assessed using Doppler Flow Velocity System. Then, left anterior descending coronary arteries were excised, mounted on wire myographs, and used to obtain vascular relaxation dose-response curves to acetylcholine (ACh).
Results: The mortality rate in IH-exposed mice was 26% versus 0% in RA-exposed mice. Compared to young (8 weeks old) RA mice, MBP was elevated in old RA mice ($p < 0.05$) and further elevated in surviving IH mice ($p < 0.0001$). Similarly, diastolic function was impaired in old RA mice ($p < 0.001$) and further compromised in old IH mice ($p < 0.0001$). Moreover, systolic function was preserved in old RA mice but impaired in old IH mice vs. old and young RA ($p < 0.0001$). Similarly, CFVR was only impaired in old IH mice ($p < 0.0001$). Interestingly, PWV was higher in old RA vs. young RA ($p < 0.001$), but significantly lower in old IH mice vs. young and old RA ($p < 0.001$). Coronary maximal ACh-induced vasodilation was significantly impaired in both old RA ($52 \pm 9\%$) and IH-exposed mice ($47 \pm 9\%$) when compared to young RA mice ($86 \pm 4\%$, $p < 0.0001$).
Conclusion: Prolonged exposure to IH simulating OSA results in elevated mortality rates and imposes substantial cardiovascular disturbances in surviving mice when contrasted with normal aging.
Support (if any): NIH grant R01-HL166617

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0282
ASSOCIATIONS BETWEEN EEG SLEEP CHARACTERISTICS AND ALCOHOL USE BEHAVIORS IN YOUNG ADULTS

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Introduction: Alcohol use disorder (AUD) is characterized by sleep disturbances, but differentiating the effects of acute

alcohol exposure, withdrawal, and chronic consumption remains an unsolved problem. This study takes a unique approach to examine proximate alcohol consumption effects on sleep electroencephalography (EEG) in young adults who engage in heavy episodic drinking. We aim to relate sleep physiology to progression from binge drinking towards AUD.

Methods: Young adults aged 21-30 years (N=88) who report weekly binge drinking (4+/5+ drinks per occasion for female/male assigned at birth) completed two nine-day ecological momentary assessment (EMA) protocols, each followed by overnight in-lab polysomnography (PSG) after negative alcohol breath test. Drinking events were recorded by EMA. EEG sleep analyses (AASM criteria) assessed sleep-wake staging and power spectral analysis. Linear mixed effect modeling examined the effects of drink number during the EMA period on measures of sleep continuity, architecture, and spectral power, adjusting for sociodemographic and behavioral covariates.

Results: Participants reported an average of 17.5+/-1.0 drinks over 3.0+/-0.1 days in each 9-day EMA period. Unexpectedly, higher drink counts were associated with lower time spent awake after sleep onset (WASO, log-transformed, BETA-STD=-0.17, p=0.028) without significant changes in sleep efficiency (p=0.06) or sleep onset latency (SOL, p=0.656). More drinks also correlated with higher number of REM periods (log-transformed, BETA-STD=0.17, p=0.022) and less REM fragmentation (log-transformed, BETA-STD=-0.21, p=0.005) without correlating with REM latency (p=0.058). Finally, consumption of more drinks was associated with decreased alpha power (8-12 Hz, log-transformed, BETA-STD=-0.1, p=0.03) but not associated with other aspects of sleep architecture or spectral power (p>0.05).

Conclusion: Contrary to our expectation of worse sleep in those with higher drinking frequency, we found that greater drink consumption was actually associated with better sleep based on parameters assessing continuity (WASO), REM sleep (number of periods, fragmentation), and spectral power (alpha power). Possible explanations include effects from binge drinking pattern, sleep improvement after alcohol detoxification, age-related resilience, or differential effects across the night. Future analyses will investigate sex differences, day-to-day drinking and sleeping relationships during EMA study period, subjective sleep quality, sleep changes across the night, and other putative covariates.

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0283

URINARY THALLIUM CONCENTRATION AND OBJECTIVE SLEEP: AN EXAMINATION IN MULTI-ETHNIC STUDY OF ATHEROSCLEROSIS (MESA)

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Introduction: Thallium (Tl), a toxic metal abundant in the Earth's crust, is a neurotoxicant that crosses the blood brain barrier and disrupts potassium-dependent neural communication. Tl's neurotoxic effects have been linked to sleep disturbance. Prior research on the relationship between Tl and sleep relied on self-reported sleep measures or were isolated to specific populations (e.g., occupational, regional). We examined the relationship between Tl and sleep by analyzing the long-term impacts of Tl exposure on actigraphy- and polysomnography (PSG)-derived sleep outcomes in a large multiethnic cohort across the United States.

Methods: We used data from Multi-Ethnic Study of Atherosclerosis (MESA). Spot urinary measurements of Tl concentration were measured at Exam 1 (2000-2002) and overnight in-home PSG with seven days of wrist-worn actigraphy were collected between 2010-2013. We employed nonparametric partial correlations to examine the relationship between log-transformed Tl and sleep outcomes, adjusting for demographics, site and urinary creatinine.

Results: 1822 adults were included (mean age 59.3 (45-84) years, 53.5% female, and 37.5% White, 27.9% Black/African American, 23.3% Hispanic, and 11.2% Chinese). Higher Tl levels were associated with actigraphy-based shorter sleep duration (rs = -.05, p < .05), higher wake after sleep onset (rs = .07, p <.01), shorter sleep maintenance efficiency (rs = -.08, p < .01), and higher activity during sleep (L5, rs = .05, p < .05). In contrast, higher Tl was related to favorable PSG-derived metrics: less %N1 (rs = -.05, p < .05), greater N3 (rs = .06, p < .05), and greater REM duration (rs = .06, p < .05). Higher Tl also was associated with higher sleep regularity (lower sleep duration SD; rs = -.06, p < .01; and Inter-day Stability: rs = .05, p < .05).

Conclusion: Tl was associated with more fragmented sleep measured at home with actigraphy, but with higher sleep regularity, and deeper sleep by PSG. The discordance of associations across sleep domains may indicate a complex effect of metal exposure and requires further investigation. Such findings may contribute to understanding the potential role of heavy metals on neurological process and sleep.

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0284

DISRUPTED NREM SLEEP PHYSIOLOGY LINKED TO 22Q11.2 DELETION SYNDROME

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Introduction: A 22q11.2 deletion (22qDel), is a recurrent copy number variant with profound impacts on neurodevelopment. Disruptions in non-rapid eye movement (NREM) sleep neurophysiology have been observed across idiopathic psychiatric disorders. However, it is unknown whether NREM disruptions exist in 22qDel carriers, who have elevated risk of developing psychiatric disorders. Here, we test the hypothesis that 22qDel carriers will exhibit disrupted NREM sleep neurophysiology across the power spectrum.

Methods: 22qDel carriers (n=12, Mage=20.42, 13-28 years, 58.3% males) and TD controls (n=11; Mage=19.18, 13-23 years, 27.3% males) completed multiple nights (89 nights total; 1-6 nights per subject; median=3 nights) of sleep EEG recordings with a wearable headband (Dreem 3). 30-second epochs were excluded for visual artifact or high 20-40Hz power. Relative power in the F7-O2 channel during NREM sleep was calculated using multitaper spectral estimation. Differences in relative

power between 22qDel carriers and TD controls were tested across 0.5-20Hz using linear mixed-effects models controlling for age and sex. False Discovery Rate (FDR) was used to correct for multiple comparisons.
Results: There was increased NREM power in slow delta frequencies (0.76-0.85 Hz; q< 0.05) and theta/alpha frequencies (5.95-9.73 Hz; q< 0.05) in 22qDel carriers, relative to TD controls. There were increases in the alpha/sigma range (9.73-12.63 Hz) in 22qDel carriers, but these results did not survive FDR correction (q< 0.10).
Conclusion: These findings suggest that neural mechanisms of NREM sleep regulation, particularly homeostatic sleep regulation, may be dysregulated in 22qDel carriers. Next steps will involve examining group differences in specific features of NREM sleep physiology (e.g., slow waves).
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0285

MEASURING SLEEP WITH THE APPLE WATCH: A COMPARISON OF A MACHINE LEARNING VERSUS TRADITIONAL ALGORITHMS TO ACTIWATCH

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Introduction: Consumer-based actigraphy has seen rapid adoption in the United States and presents an underutilized opportunity and resource for ecologically valid sleep-wake monitoring. Furthermore, with the discontinuation of Philips Actiwatch, a reliable and scalable alternative is required. Apple Watch may be a promising solution, with prior data indicating strong concordance for activity counts derived from the Apple Watch compared to the Actiwtach. The present study extends previous findings to sleep periods as an outcome of interest.
Methods: A community sample of 40 adults wore an Actiwatch and Apple Watch for 7 to 14 days with daily completion of the consensus sleep diary. Sleep periods from both wrist-worn devices were calculated and compared with sleep periods reported on the sleep diary. Sleep based on Apple Watch was derived using two approaches: one that mirrored traditional actigraphy (ie, sleep-wake classification using the Cole-Kripke model), and another than utilized machine learning with steps and heart rate as inputs. Agreement of sleep periods between the wrist-worn device and the sleep diary was operationalized as percent overlap. Performance of Apple Watch compared to the Actiwatch was then evaluated using the ratio of percentage overlap with sleep diary. A ratio of 1.00 represents perfect agreement.
Results: The agreement between Apple Watch derived sleep periods and sleep diary was comparable to that with Actiwatches. The ratio of percentage overlap between the two devices was 1.00 when using the machine learning algorithm, and 0.97 when using the traditional actigraphy approach. When averaged across the sample, sleep periods derived from Actiwatch overlapped by 80.7% (95% CI [84.1% - 77.3%]) with sleep diary periods, and sleep periods derived from Apple Watch overlapped by 82.0% (95% CI [84.7% - 79.4%]) and 81.2% (95% CI [84.9% - 77.5%]) for the machine learning and traditional actigraphy approaches, respectively. Total sleep period from the Apple Watch produced lower mean absolute errors compared to Actiwatch (machine learning: 24.8 minutes, traditional actigraphy approach: 19.1 minutes).
Conclusion: Sleep periods derived from Apple Watch data showed strong agreement with Actiwatch data, with the machine learning algorithm showing slightly stronger performance compared to the Cole-Kripke algorithm.
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0286

PREDICTIVE MODEL OF SLEEP SLOW OSCILLATIONS EMERGENCE ON THE ELECTRODE MANIFOLD

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Introduction: Due to slow oscillations (SO; 0.5-1.5 Hz) known role in cognition and health, brain stimulation techniques targeting SOs in closed loop are being developed as potential clinical interventions, as they hold promise for improving cognitive functions. SO-targeting closed-loop stimulation protocols currently strive to identify SO occurrences in real time, a computationally intensive step that can lead to reduced precision (compared to post-hoc detection). These approaches are also often limited to focusing on only one electrode location. Enabling prediction of SO emergence across the electrode manifold could remove the need for online detection, thus greatly advancing the development of personalized and flexible brain stimulation paradigms. This study presents a computational model that predicts SO occurrences at multiple locations across a night of sleep.
Methods: SOs were detected in a dataset of nighttime sleep of 22 subjects (9 females), with 64 EEG channels. We study SO emergence at progressively more refined time scales. Modeling of SO occurrence was achieved for SOs in slow wave sleep (SWS), or in a combination of stage 2 and SWS (S2&SWS). First, the cumulative SO occurrences in successive sleep cycles were successfully fit with exponentials. Secondly, the SO timing in each individual was modeled with a renewal point process. Using an inverse Gaussian model, we estimated the probability density function of SO timing and its parameters μ (mean) and λ (shape; representing skewness) in successive cycles.
Results: The analysis reveals an exponential decrease in SO count across sleep cycles, with a decay rate per cycle of 1.49 for SWS and 1.09 for S2&SWS. The SO timing model for SWS also demonstrates an exponential increase in model parameters (μ, λ) across cycles, with increase constants per cycle at 0.38 and 2.65, respectively. These findings imply that personalized model parameters can be estimated building on SO information in the first sleep cycle, and hence SO timing can be predicted before its occurrence with a probability distribution.
Conclusion: This study establishes a predictive model for SO occurrence during NREM sleep, providing insights into its organization in successive cycles and at different EEG channels, which is relevant to development of stimulation paradigms.
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0287

SAFTER: AN R PACKAGE FOR THE SAFTE MODEL

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Introduction: The Sleep, Activity, Fatigue, and Task Effectiveness (SAFTE) model is a framework that predicts individual performance changes based on variations in circadian phase and sleep/wake schedules. The SAFTE model is used by industries in which fatigue risk is relevant to safety through licensed software like SAFTE-FAST. The SAFTE model may provide helpful context during the analysis of objective and performance sleep data but a full software license may be cost-prohibitive. SAFTEr was created as an open-source R package to allow the use of the original patented SAFTE model as a freely available research tool.
Methods: The SAFTE algorithm was rebuilt from patent equations in collaboration with SAFTE inventor Steven Hursh using the R-coding language. The R package was broken down into three primary steps: 1) formatting data into 1-minute epochs; 2) fitting SAFTE model predictions to the data; and 3) graphing the dataset. SAFTEr includes 17 constants identified in the model and 20 output variables that can be computed on an epoch-by-epoch basis. SAFTEr is best suited for schedules that do not induce a phase change, because the simplified model does not detect and automatically shift circadian phase.
Results: The current version of the SAFTEr package (0.1.2) consists of six functions that model and graph time-based datasets of sleep/wake data and include the ability to customize bedtimes, study start and end times, and events markers. The six functions include: 1) formatting data; 2) identification of possible missing data; 3) modeling; 4) generation of individual graphs with graphic overlay of event markers against the modeled data; 5) graph overlay to compare variables of interest against the SAFTE model as a line chart or; 6) as a scatter plot.
Conclusion: The SAFTEr package is freely available for use by researchers who wish to predict cognitive performance as a function of objective sleep data. The SAFTEr package is an open-source recreation of the SAFTE model that gives anyone with a basic knowledge of R the ability to apply the model to their own data as well as graph it against other measurable tests.
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0288

IN-VITRO MODEL OF THE MICROCIRCULATION IN OSA BASED ON PATIENT PROFILE

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Introduction: Microcirculatory endothelial dysfunction is a critical marker of subsequent cardiovascular disease in the population. We recently reported a profile of obstructive sleep apnea (OSA) specific gene changes in the human microcirculation. We sought to develop a precise in-vitro model of the microcirculatory effects of OSA using an intermittent hypoxia (IH) exposure that produces similar gene profile changes to that observed in patients with OSA.
Methods: We selected a cell line of immortalized human microvascular endothelial cells (HMEC). Then, we estimated the oxygen tension exposure of the peripheral circulation during OSA assuming a decrease from 120 mmHg in the pulmonary arteries to about 30 mmHg in the microcirculation. During a single episode of apnea, alveolar partial pressure of oxygen (PAO2) and the PaO2 at the level of the pulmonary arteries decrease slightly by about 10%. Therefore, we selected a fluctuation between 30-40 mmHg as baseline (normoxia), and 25-30mmHg to correspond with this decrease during apnea. We used a gas treatment 6-well cell culture chamber (model NOX-E.5-GTC, Noxygen) and monitored the O2 levels in the medium (cell level) and in the gas space with fluorescent oxygen analyzer (Oxylite, Optronix). We selected a 300 second cycle length and an exposure duration of 6-8 hours (72 cycles).
Results: Compared to HMECs in control normoxia, HMECs exposed to the IH protocol showed a profile change similar to that reported in humans with OSA with significant increase in oxidative and inflammatory genes. There was significant upregulation in NADPH subunit NOX4's from 0.0439 to 0.1570 relative copy number (RCN), p= 0.049. Endothelin (EDN-1) expression increased from 1.0330 to 2.4171 p= 0.002. Superoxide dismutase (SOD-1) increased from 2.1336 to 2.4600 (p= 0.028). Interleukin 8 increased from 0.0891 to 0.2744 (p= 0.020). Interleukin 1-B increased from 0.0193 to 0.0439 (p= 0.048). Additional changes included a decrease in nitric oxide synthase .
Conclusion: The selected IH protocol produced similar gene profile changes in HMECs as those found in patients with OSA before treatment. This model can serve to evaluate the pathways specific to OSA's impact on the microcirculation and to test pharmacological therapies to target OSA-specific vascular disease.
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0289

SLEEP FRAGMENTATION AND ESTRADIOL SUPPRESSION EFFECTS ON CARDIOMETABOLIC HEALTH IN WOMEN: AN EXPERIMENTAL MODEL

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Introduction: The risk of cardiovascular disease increases during the menopausal transition. In addition to estradiol decline during the transition, there is increased sleep fragmentation due to hot flashes, without reduced total sleep time. We examined the impact of sleep fragmentation and estradiol decline on cardiometabolic outcomes in an experimental menopause model implemented in premenopausal women.
Methods: We studied 38 healthy premenopausal women (mean age [±SD] 29.7±6.7 years) in a 5-night inpatient study under eucaloric conditions, once in the mid-to-late follicular phase (high estradiol) and again after gonadotropin-releasing hormone agonist-induced estradiol suppression in a subset (n=27). Each inpatient study involved 2 nights of unfragmented sleep followed by 3 nights of experimentally sound-induced sleep fragmentation to achieve ~1 h of wake after sleep-onset, without reducing total sleep time. Cardiometabolic endpoints (serum and vitals)

were collected while fasted within 1 h of waking each morning. Values were normalized relative to each individual's baseline (estrogenized, unfragmented sleep) and then compared between conditions using generalized linear mixed models.
Results: Sleep fragmentation across both estradiol states combined significantly lowered self-rated satiety by 13% (p=0.048), and increased hunger by 30%, although this difference did not reach significance (p=0.25), and leptin and acylated ghrelin levels were unchanged (both, p≥0.13). Sleep fragmentation significantly reduced triglycerides by 7% (p< 0.01) and increased heart rate (HR) by 6% (p< 0.01). All other cardiometabolic endpoints were unchanged by sleep fragmentation (p≥0.22). E2 suppression lowered self-rated satiety by 5% and increased hunger by 28%, but neither of these were significant (both, p≥0.28), and significantly lowered leptin levels by 6% (p=0.001), and increased ghrelin by 7% although this did not reach significance (p=0.13). Estradiol suppression across both sleep conditions combined significantly increased triglycerides, total cholesterol and HDL-C by 5% to 8% (all, p< 0.01) but not LDL-C (p=0.18). Estradiol suppression significantly reduced HR by 4% (p< 0.01) and trended to increase diastolic blood pressure by 3% (p=0.06), with no change in systolic blood pressure (p=0.16).
Conclusion: Findings support independent contributions of estradiol decline and sleep fragmentation during the menopause transition toward positive energy balance and adverse changes in cardiovascular disease risk factors.
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0290

SEX DIFFERENCES: NICOTINE USE AND ABSTINENCE EFFECTS ON SLEEP ARCHITECTURE IN FEMALE AND MALE C57BL/6J MICE

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Introduction: Nicotine withdrawal symptoms play a major role in relapse rates, and sleep disturbances occurring during withdrawal are a reliable predictor of relapse. Additionally, research has shown that both nicotine withdrawal symptoms and sleep disturbances are sex dependent. Thus, understanding sex differences in sleep architecture during abstinence is critical for treating nicotine addiction. This study aims to investigate sex differences in sleep architecture in female and male C57BL/6J mice undergoing nicotine abstinence.
Methods: EEG/EMG implantation devices were surgically implanted to capture sleep data (n = 9 males, n = 11 females). Mice were individually housed in a 12-hour light/dark schedule. During pre-nicotine baseline, mice received a vehicle solution containing 0.2% saccharin in water. To induce nicotine dependence, 200 µg/ml nicotine was added to the saccharin solution and oral nicotine exposure occurred for 14 days. Abstinence was initiated by removing nicotine from the drinking solution after the 14 day exposure. EEG/EMG was scored for 2 days during baseline and averaged and scored for 4 days during oral nicotine exposure and averaged. EEG/EMG for days 1, 2, and 5 were analyzed individually to assess the duration of any sleep disruptions. Sirenia software was used to determine sleep stages in 4 second epochs. A repeated measures ANOVA test was used along with Dunnett's post-hoc test.
Results: Nicotine exposure reduced total sleep and NREM time in both females and males during 24-Hour and active phase measures. Abstinence induced a sleep fragmentation phenotype, as defined by an increase in sleep bout frequency with a decrease in sleep bout duration, during the inactive phase in both females and males –. Females had a much more robust sleep fragmentation. Females also exhibited NREM fragmentation.
Conclusion: Nicotine exposure has similar effects to total sleep time and NREM percent time during the 24—hour and active phase measures regardless of sex. Female mice experienced a much robust sleep fragmentation phenotype compared to male mice. NREM fragmentation, which underlined the greater sleep fragmentation phenotype, was unique to female mice.
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0291

EVALUATING SLEEP QUALITY METRICS USING ZERO-EFFORT TECHNOLOGY: IMPLICATIONS FOR PUBLIC HEALTH DYNAMICS

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Introduction: Sleep quality is critical to human health and well-being, with implications for manifold physiological and psychological processes. The quality and reliability of the data due to recall bias and subjective interpretation often limit traditional methods of sleep data collection. This research presents a novel framework that can objectively measure and evaluate sleep quality using smart thermostats equipped with motion sensors, providing non-invasive and effortless sleep monitoring.
Methods: We leveraged the ecobee 'Donate Your Data' initiative, which collects data from smart home sensors, to analyze 8 Terabytes of data from 178,706 households. In our time-series model, sensor activation values were transformed into signals to model sleep features. We developed a data pipeline integrating data preprocessing, feature engineering, and various machine learning models. These models, such as RNN, VAE, K-means clustering, PCA, and Random Forest classifiers, were used to discern sleep quality indicators. These indicators included Absolute Sleep Duration, Normalized Disturbance Time, Wakeup Onset and Sleep Onset Time, Time in Room, and Sleep Efficiency (with and without onset time) derived from motion sensor data.
Results: Our findings show three distinct sleep quality clusters, with clear variations in sleep duration, disturbances, and efficiency. Cluster 0 profiled a pattern of fewer disturbances and higher sleep efficiency, whereas Cluster 1 indicated a moderate disturbance with prolonged sleep onset and wakeup duration. The lowest average sleep duration and varied disturbances characterized Cluster 2. Comparative analysis underscores the heterogeneity in sleep quality, highlighting the potential of Internet of Things (IoT) devices in identifying sleep patterns and contributing to sleep research without invasive monitoring. These clusters demonstrate the heterogeneity of sleep quality and showcase the potential of Internet of Things (IoT) devices in sleep pattern identification.
Conclusion: This novel approach shows smart thermostats as a viable data source for evaluating sleep quality, providing a new perspective on technology in health surveillance and paving the way for personalized sleep improvement strategies for sleep technologists and healthcare policymakers. Furthermore, integrating temperature data from ecobee datasets could deepen insights into the connection between indoor temperature and sleep, impacting health monitoring and policy in the context of increasing global temperatures from climate change.
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0292

DETECTING SLEEP DEFICIENCY WITH VOICE BIOMARKERS AND MACHINE LEARNING

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Introduction: Accurate biomarkers of insufficient sleep have been a central interest of sleep scientists. Given advancements in artificial intelligence, researchers have explored non-invasive digital biomarkers from human voices. In this study, we conducted a within-participant counterbalanced controlled trial of chronic sleep restriction (CSR) and leveraged machine learning to investigate voice biomarkers for detecting sleep deficiency.
Methods: Healthy young adults completed a 32-day in-patient protocol. The protocol included 5 days of baseline 8-hour time-in-bed (TIB) followed by 5 days of CSR (5-hour TIB), during which their light exposure, activity, and diets were controlled. Every 4 hours during waking episodes, a voice measurement (VM) was administered via computer. During each VM, the participant read 10 sentences at their habitual volume, pitch, and pace. The sentences were phonetically balanced and tailored for professional speech quality assessment. Each VM used different sentences to prevent memorization. An omnidirectional microphone with an adjustable stand was used. 85 common acoustic features, such as fundamental frequency, formants, and mel-frequency cepstral coefficients, were extracted from each VM. Additionally, 11 features from the Cepstral Spectral Index of Dysphonia were extracted, forming a 96-dimensional vector. Within each participant, the vectors were z-scored to remove personal vocal traits. After dimension reduction via principal component analysis, under a leave-one-out procedure, we trained a support vector machine (SVM) to classify recordings into those taken during CSR or baseline. We tested the SVM on one unseen participant every iteration.
Results: After excluding low-quality data, we analyzed 196 VMs (100 during CSR and 96 during baseline) from 5 participants, including 1 non-native English speaker. The SVM reached a sensitivity of 0.74 (95% CI: 0.71-0.78), a specificity of 0.71% (95% CI: 0.68-0.75), and an area under the ROC curve of 0.76 (95% CI: 0.73-0.80) in classifying CSR vs. baseline conditions.
Conclusion: These preliminary findings reveal that vocal characteristics may represent a target for non-invasive, objective sleep deficiency biomarkers. Additional studies in both controlled conditions and field settings should be carried out to explore whether features of the human voice can be developed for non-intrusive monitoring of sleep status for sleep disorders patients, fitness-for-duty evaluations, and other applications in ambulatory settings.
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0293

EVALUATION OF A SINGLE POINT OF CONTACT CHEST-WORN HSAT WITH ECG-BASED ATRIAL FIBRILLATION DETECTION

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Introduction: Obstructive sleep apnea (OSA) is highly prevalent, underdiagnosed, and often comorbid with cardiac arrhythmias such as atrial fibrillation (AF). Existing home sleep apnea tests (HSATs) remain complex, often requiring multiple points of contact, and do not provide gold-standard ECG-based arrhythmia detection. A simplified HSAT with expanded capabilities

for ECG-based arrhythmia detection could bridge this diagnostic gap, stimulate sleep-cardiology collaborations, and reduce patient burden; resulting in more comprehensive, patient-centered care. Here we performed a comparative PSG evaluation of the Sansa device (Huxley Medical, Inc.), a single point of contact HSAT worn on the chest that provides heart rate, oximetry, respiratory effort, total sleep time (TST), and ECG.
Methods: Patients undergoing PSG for suspected OSA were enrolled at three sleep laboratories. The chest-worn HSAT was used during overnight, level I PSG. Manually scored PSG (AASM manual 3.0) parameters were compared to the chest-worn HSAT's associated parameters for AHI requiring hypopneas with 4% oxygen desaturation (sAHI4%), AHI requiring hypopneas with 3% oxygen desaturations (sAHI3%), TST, and classification of moderate-to-severe OSA (AHI≥15). AF and premature ventricular complexes (PVC) were visually compared between ECG derived from PSG and chest-worn HSAT.
Results: Enrollment included 101 patients (47% male, age 52±18 years, BMI 32±9 kg/m2, 27% Fitzpatrick skin tone 5-6). The chest-worn HSAT detected moderate-to-severe OSA with 90% sensitivity and 92% specificity (AHI4%, 37% prevalence) and 88% sensitivity and 80% specificity (AHI3%, 45% prevalence). Strong agreement was demonstrated for sAHI4% (-15.9 to 14.5 95% limits of agreement, LoA), sAHI3% (-23.6 to 20.7 95%-LoA), and TST (-62.0 to 87.7 95%-LoA). Preliminary visual review of ECG showed AF and/or PVCs in at least 15% of overnight recordings, in agreement with corresponding PSG ECG.
Conclusion: Non-flow-based HSATs to assess OSA are increasingly available; however, here we present the performance of a novel device to simultaneously diagnose OSA and AF (and other arrhythmias). Given the relevance of OSA treatment in successful AF management, these data highlight the capacity of a single point of contact chest-worn HSAT in the simultaneous diagnosis of both disorders toward downstream benefits of hastening OSA treatment to improve AF outcomes.
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0294

PERFORMANCE OF COMMERCIAL WEARABLE DEVICES FOR TRACKING IRREGULAR SLEEP SCHEDULES

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Introduction: Many new popular commercial wearable devices perform well at tracking sleep/wake patterns, often equaling or exceeding the sleep-tracking performance of research-grade actigraphy. However, commercial wearables have not been subjected to extensive testing under irregular sleep schedules, such as split sleep and daytime sleep/naps, common in shift-working and operational populations. Therefore, to continue uncovering their real-world strengths/limitations, we evaluated the sleep-tracking performance of commercial wearables in people with irregular sleep schedules.
Methods: Participants were 12 healthy young adults (6 men, 6 women; 28.3±4.8 years, mean±SD) with habitual irregular sleep schedules, often due to shift work, sleeping or napping during daytime hours at least twice weekly. They completed sleep diaries and used actigraphy (Philips Respironics Actiwatch 2) and a set of wearables for 1 week under unrestricted home sleep conditions. Wearables included the Garmin Fenix 7 (GF) and Oura Rings (OR; generations 2 and 3). Device performance was compared with an electroencephalography headband (Dreem 3; Beacon Biosignals) and sleep diaries. Analyses included epoch-by-epoch agreement (sensitivity [for sleep] and specificity [for wake]) and summary bias comparisons for time in bed (TIB) and total sleep time (TST).
Results: Device sensitivity and specificity, respectively, were Actiwatch (0.92, 0.44), GF (0.96, 0.35), and OR (Gen-2: 0.92, 0.64; Gen-3: 0.93, 0.60). Device mean biases for TIB and TST were low for Actiwatch and both ORs but were higher and with significant proportional bias for GF. This appeared to be driven by GF combining multiple sleep episodes into single long episodes, which produced very long sleep recordings on those days when split sleep occurred.
Conclusion: Overall device sensitivity was high and specificity was low to medium, similar to previously known performance limitations of actigraphy and commercial wearables. However, OR had ~20% higher specificity than in our previous testing, suggesting improved wake-tracking performance in newer OR models/algorithms. Like previous GF models we tested, GF again underperformed in specificity and summary TST tracking. This underperformance raises concerns for real-world uses of GF with its current algorithm, especially regarding the finding that extreme summary bias values sometimes occurred when GF combined multiple sleep episodes/naps during split sleep schedules.
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0295

INFLUENCE OF SLEEP REGULARITY, CHRONOTYPE, AND SLEEP DURATION ON DAYTIME SLEEPINESS CAUSED BY SLEEP DISORDERS

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Introduction: Excessive daytime sleepiness is characterized by the difficulty of staying awake during daytime. The goal of this research is to examine the role of regularity, sleep duration, and chronotype on the association between sleep disorders and daytime sleepiness. To do this, we leveraged the Sleep Number platform to acquire longitudinal objective sleep with survey data from a single point in time.
Methods: An IRB-approved survey, which included questions about diagnosed sleep disorders and daytime sleepiness, was presented to a cohort of Sleep Number customers in the June 12 to 26, 2023 period. Objective data including sleep duration, bedtime, restful sleep duration, mean breathing rate, and heart rate collected between May 1 and June 30, 2023 were used along with survey responses. Individual sleep regularity and chronotype were quantified using objective data. Regularity was categorized into regular or irregular if bedtime variability was lower or greater than 60 minutes. Chronotype was categorized into early, intermediate, or late if mean sleep onset time was before 10 pm, between 10 and 11:59 pm, or after 12 am. Odd-ratios (OR) were used to quantify the influence of regularity, chronotype, and sleep duration on daytime sleepiness moderated by sleep disorders.

Results: The responder count was 22,082 (9530M/12479F). Men were 56.6 (SD 13.9) and Women 54.9 (SD 13.8) years-old on average. Daytime sleepiness was significantly associated with the presence of untreated sleep disorders (insomnia, apnea, and RLS). Individuals being treated for apnea and insomnia demonstrated significantly less daytime sleepiness. Healthy individuals showed a significant association between early chronotype and longer sleep duration with reduced daytime sleepiness. Individuals with apnea who receive treatment showed a significant association between longer sleep and reduced daytime sleepiness. In the case of insomnia, regularity, chronotype or sleep duration do not moderate any significant relationship with daytime sleepiness. For RLS longer sleep duration leads to lower daytime sleepiness.
Conclusion: Daytime sleepiness is significantly associated with any untreated sleep disorders. Regularity, chronotype and sleep duration had limited influence on daytime sleepiness caused by sleep disorders. Healthy individuals had lower daytime sleepiness if they had an earlier chronotype and longer sleep duration.
Support (if any):

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0296

THE RELATIONSHIP BETWEEN SLEEP METRICS, AGE AND SEX IN A LARGE COHORT STUDY

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Introduction: The aims of the study are to investigate the relationship between sleep metrics, age and sex in a large cohort study
Methods: Wrist acceleration data (GT9x, ActiGraph) was collected from 10,175 subjects in the National Health and Nutrition Examination Survey (NHANES) 2013-2014 for up to 8 days. Data from the tri-axial accelerometer was sampled at 80hz and was processed using the sleep analysis pipeline from ActiGraph. The sleep analysis pipeline first consisted of wear detection, followed by total sleep opportunity detection and then finally sleep / wake classification within the total sleep opportunity. The total sleep opportunity algorithm detects one sleep opportunity per 24-hour cycle (in noon-to-noon windows) and allows for up to 60 minutes of continuous sleep disruption within the sleep opportunity. The following sleep metrics were calculated in each total sleep opportunity using the DACNN sleep / wake classification algorithm: total sleep time (TST), wake after sleep onset (WASO) and sleep efficiency (SE). These sleep metrics were combined with age and gender data from the study to perform a Pearson product correlation (r).
Results: For females in the study (n=3790), TST had a Pearson r of -0.285, WASO had a Pearson r of 0.149 and SE had a Pearson r of 0.058. For males in the study (n=3529), TST had a Pearson r of -0.300 versus age, WASO had a Pearson r of 0.192 versus age and SE had a Pearson r of -0.005 versus age.
Conclusion: Sleep measures showed low correlation to age in both the male and female cohorts. This is contrary to the information that sleep quality declines as individual ages. Perhaps the participants in this cohort were healthy enough that decline in sleep metrics was not observed.
Support (if any): This research was funded by ActiGraph L.L.C.

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0297

COMPARING VALIDATION METRICS OF MACHINE LEARNING ALGORITHMS FOR ACTIGRAPHY DATA IN CHILDREN

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Introduction: Actigraphy methods are evolving to use machine learning algorithms for sleep health estimation, but most algorithms have been trained on adult data. It is not known if such algorithms can be used for sleep/wake estimation in children. We therefore leveraged machine learning models, trained with adult data for sleep prediction, to determine their validity in a sample of children.
Methods: We enrolled 30 children (14 female, 8-16y) referred for in-lab overnight polysomnography at Children's Hospital of Philadelphia. Participants wore a GENEActiv device (a 3-axis accelerometer, set at 50 Hz sampling rate) on their non-dominant wrist while completing their overnight sleep test. Machine learning models trained using adult data by Walch et al. were applied to the accelerometer data, and aligned into 30-second epochs against the sleep stages from polysomnography scored by a sleep medicine physician. We used the F1 score, a harmonic average of sensitivity and precision, to rank the algorithms.
Results: Overall, 271.5 hours of polysomnography data were collected with 80% of the epochs scored as sleep. Sleep duration median was 7.0 hours (IQR = 2.0), WASO median was 39 minutes (IQR = 39), and sleep latency median was 48.5 minutes (IQR = 52.5). In rank order, the top average F1 scores were 0.91 (SD=0.04) for k-Nearest Neighbor (kNN), 0.86 (SD=0.05) for Neural Net, 0.83 (SD=0.05) for Logistic Regression, and 0.78 (SD=0.06) for Random Forest. Average sleep duration error was lowest for kNN (12.8 minutes [SD = 44.9]) and highest for Random Forest (-142.1 minutes [SD = 57.5]); the average WASO error was lowest for kNN (9.8 minutes [SD = 45.9]) and the highest for Random Forest (118.0 [SD = 58.9]); whereas the average sleep latency error was lowest for Random Forest (-3.4 minutes [SD = 27.6]) highest for kNN (-32.2 minutes [SD = 34. 8]).
Conclusion: Certain machine learning models trained with adult datasets performed well when applied to pediatric data, with kNN being the most optimal in accuracy. However, validity for sleep latency was the most optimal for Random Forest. Further development can potentially reduce the variation of these predictions with pediatric-data-based machine learning models.
Support (if any):

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0298

COMPARING YOUTH-REPORTED, CAREGIVER-REPORTED AND FITBIT SLEEP MEASURES IN A LARGE EARLY ADOLESCENT SAMPLE

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Introduction: Healthy sleep is critical for the physical, emotional, and cognitive development of adolescents. Capturing the multidimensional components of sleep behavior in this age group remains a challenge, particularly when relying on retrospective questionnaires. This study compares sleep data collected via youth-report, caregiver-report and from Fitbit devices in a large, diverse sample of early adolescents.

Methods: This study analyzed data from the Adolescent Brain Cognitive Development (ABCD) Study, comprising 11,879 US adolescents (Year 2 age: 11−14 years). The participants self-reported their sleep period (from falling asleep to wake-up time) via the Munich Chronotype Questionnaire, while their caregivers completed the Children's Sleep Disturbance Scale. A subset (N = 4,282, Mean Age = 11.97 years, 51.19% female) also wore Fitbit Charge 2 devices for sleep tracking for 21 days, directly following the annual assessment. We evaluated the internal consistency of the questionnaires and employed Bland-Altman and interclass correlation analyses to compare self-reported and Fitbit measures of sleep period.

Results: We found acceptable internal consistency in the youth-reported (α = 0.71) and caregiver-reported (α = 0.83) sleep questionnaires. There was a greater discrepancy between caregivers and adolescents when adolescents reported sleep durations less than 7 hours: 38% of caregivers reported 7-8 hours and 35% reported 8-9 hours whereas only 15% reported < 7 hours. Compared to Fitbit measures adolescents generally estimated their sleep period with reasonable accuracy (ICC = 0.182 [0.15, 0.21] p<.001), displaying an average discrepancy of 40.5 minutes on weekdays.

Conclusion: The findings indicate that there is reasonable agreement between youth-report and Fitbit measures of sleep period in adolescents, opening up the possibility for assessing the complexity of sleep behavior. In this age group, caregivers tend to overestimate the adolescents' sleep duration, which highlights the importance of youth-reported sleep along with objective measures. This study contributes valuable insights into the methodology of sleep research and underscores the need for multidimensional approaches in assessing sleep patterns in adolescents.

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0299

AN EXAMINATION OF DISCREPANCIES IN SLEEP DEVICE DATA CAPTURED BY SLEEP RING, FITBIT, ANDACTIGRAPHY

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Introduction: Wearable devices have improved access to sleep data by empowering patients with greater control over their information. However, the choice of the best wearable for sleep measurement remains uncertain. This study investigated variations in sleep data collected by Sleep Ring, Fitbit, and Actigraphy in a diverse US group of Black adults.

Methods: Wearables descriptive statistics were calculated for sleep efficiency (% by time in bed/ time sleep), REM duration (in minutes), awakening (count), and total sleep duration (in minutes) where data was available. One-sample t-tests were conducted for sleep efficiency (Sleep Ring and Actigraphy), REM duration (Sleep Ring and Fitbit), and awakening (Fitbit and Actigraphy). ANOVA was conducted for total sleep duration (Sleep Ring, Fitbit, Actigraphy). Significance was specified as α=0.05.

Results: Participants (Sleep Ring N=199, Fitbit N=147, Actigraphy N=202) were predominantly female (71%, Mage=48.9) compared to male (28%, Mage=50.2). Using the Insomnia Severity Index, 35% were insignificant, 37% met subthreshold, 23% exhibited moderate severity, and 5% reported severe insomnia. Sleep efficiency for Sleep Ring (M=77%, SD=10.4; t(198)=104.6, p<.001) was significantly different than Actigraphy (M=93%, SD=3.3; t(201)= 397.7, p=<.001). REM duration for Sleep Ring (M=62 minutes, SD=29; t(198)=30.0, p<.001) was also significantly different Fitbit (M=70 minutes, SD=26; t(142)= 31.6, p<.001). Additionally, there was a significant difference in awakening count in Fitbit (M=15 times, SD 7; t(146)=26.6, p<.001) compared to Actigraphy (M=9 times, SD=4; t(201)= 28.7, p<.001). ANOVA indicated an effect of sex on sleep duration for all devices: Sleep Ring [M=368 minutes, SD=106; F(1,197)= 5.4,p=.021], Fitbit [M=305, SD=89; F(1,145)=13.4,p<.001] and Actigraphy [M=374 minutes, SD=163; F(1,198)=4.9,p=.027).

Conclusion: Differences among wearable devices exist. Actigraphy may overestimate sleep efficiency, while Sleep Ring may provide poor estimates. REM duration is similar in Sleep Ring and Fitbit but more variable in Sleep Ring. Sleep duration ranked highest in Actigraphy, but also exhibited the highest variance/deviation, followed by Sleep Ring and Fitbit. Fitbit is more sensitive in detecting awakenings compared to Actigraphy. Future research should exploresleep health parameters across wearable devices to ensure accuracy in Blacks, considering discrepancies in metrics potentially due to differences in skin tone and the impact of refractory lights

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0300

INTERIM ANALYSIS FROM THE OURA VALIDATION STUDY: EXAMINING SLEEP STAGING FROM OURA RINGS WORN SIMULTANEOUSLY

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Introduction: Sleep tracking using consumer devices is increasingly prevalent in the population. Given this interest, it is essential that data produced by these monitors is reliable and accurate. In a single night study with the primary aim of validating the Oura Ring in comparison to polysomnography (PSG), participants wore Oura Rings on their right and left hand. This interim analysis explores the correlation between the rings with respect to total sleep time (TST) and sleep staging.
Methods: Participants (n=20) underwent single-night PSG in the Brigham and Women's Hospital Center for Clinical Investigation. Each participant wore two Gen3 Oura Rings, one on each index finger, both running the Oura Sleep Staging Algorithm 2.0. We computed within-subject nightly totals for TST and sleep stages (light sleep; deep sleep; and Rapid Eye Movement, REM sleep) as detected by each ring. Then, we computed pairwise correlation coefficients for sleep and sleep staging data between the rings.
Results: Participants were 75% female and 25% male; 20% Asian, 10% Black/African American, and 60% White; 15% were Hispanic. Average age was 30.7±7.8 years. In-lab bedtimes ranged from 9:15 pm–1:40 am and waketimes from 5:15 am–9:40 am. On the Beck Anxiety index, most participants (95%) demonstrated minimal anxiety. No participants met criteria for insomnia (Athens Insomnia Scale), sleep apnea (Berlin Sleep Questionnaire), or Restless Legs Syndrome. On the Pittsburgh Sleep Quality Index, most participants reported good sleep quality (90%). Correlation between the rings was 0.90 ($p< 0.001$) for TST, 0.85 ($p< 0.001$) for wake. 0.83 ($p< 0.001$) for light sleep, 0.86 ($p< 0.001$) for deep sleep, and 0.86 ($p< 0.001$) for REM sleep.
Conclusion: We observed a high correlation between TST and sleep staging data from Oura Rings worn on the left and right hands simultaneously, similar to those observed between Registered Polysomnographic Technologists. We plan to examine how Oura sleep staging relates to PSG, and whether agreement is associated with hand dominance.
Support (if any): This project was funded by Ouraring Inc. and the studies were carried out at the BWH CCI, with support from Harvard Catalyst, The Harvard Clinical and Translational Science Center (NIH UL1TR002541). Additional support from the NHLBI (K01HL150339).

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0301
INVESTIGATING THE IMPACT OF DAILY AND NIGHTTIME NOISE ON SLEEP DURATION: INSIGHTS FROM AN APPLE WATCH STUDY

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Introduction: Noise exposure is commonly believed to influence sleep quality adversely. This study aims to scrutinize the relationship between both daytime and nighttime noise exposure and sleep duration while considering the influence of sleep deficiency from the previous night. The study aims to explore the correlation between daily and nighttime noise exposure and sleep duration, accounting for the impact of insufficient sleep from the previous night.
Methods: In a 6-week study, 15 university students (5 males and 10 females) wore an Apple Watch to collect data on sleep duration, wake time, time in bed, ambient noise levels, daily step count, and previous night's sleep duration. Linear regression models were applied, adjusting for physical activity and previous sleep deficiency, to analyze the relationship between noise exposure and sleep outcomes.
Results: Contrary to initial hypotheses, the study found no statistically significant correlation between either daily or nighttime noise exposure and the assessed sleep parameters ($p>0.05$). This was consistent even after accounting for the duration of the previous night's sleep and daily physical activity levels.
Conclusion: This study did not find evidence to support a significant relationship between noise exposure (both daily and nighttime) and sleep duration in university students. These results contribute to the nuanced understanding of sleep dynamics and its environmental influences. Further research, potentially involving larger or more diverse samples and varied methodologies, are encouraged. The study also demonstrates the utility of wearable technology in collecting comprehensive sleep and environmental data.
Support (if any):

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0302
SLEEP STAGING CLASSIFICATION FROM WEARABLE SIGNALS USING DEEP LEARNING

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[1] Google

Introduction: Typical data derived from a wrist worn device include accelerometer and photoplethysmogram (PPG) sensor signals . These reflect underlying movement, heart rate, and vascular dynamics that contain sleep stage information. We investigated the ability of a deep learning network to map raw data from such sensors to estimated sleep stages defined by full polysomnography scoring.
Methods: A convolutional neural network (CNN) was proposed for application to raw PPG (green light at 25 Hz) and 3D accelerometer data (also sampled at 25 Hz). The CNN had 70 hidden layers and output labels were mapped to four classes (wake, light sleep, deep sleep, and REM sleep) where light sleep is defined as Stages N1 and N2. The CNN was pretrained using 1654 records of finger PPG data from the Multi-Ethnic Study of Atherosclerosis (MESA) sleep records. The system was then further trained and evaluated on an internal set of 184 records obtained from adults (mean age = 68) with corresponding scored PSG sleep stage labels. Data augmentation techniques were used to create additional training data. The system was then tested using a withheld data set of 16 records. The overall performance of the system was evaluated by calculating two stage (wake versus sleep) and four stage accuracy and Cohen's kappa values (κ).
Results: The overall performance for two-stage wake/sleep classification was an accuracy of 0.94 and κ=0.79. For four stage classification, the accuracy was 0.79 and κ=0.66. A comparable figure for expert human scoring four-stage class is accuracy of 0.8-0.85 and κ=0.7-0.75.
Conclusion: Raw accelerometer and PPG signals contain a significant amount of information related to underlying sleep stages, and can be trained to produce hypnograms which approach the accuracy of human scorers. This may provide utility for both multi-night clinical use and underlying research in sleep science.
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0303

PREDICTING SUBJECTIVE SLEEP IMPAIRMENT AND DISTURBANCE FROM WEARABLE SLEEP DATA

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Introduction: Wearables offer scalable, passive and objective measures of sleep, but how well do they capture feelings of sleep disturbance and impairment? We studied a large, diverse group (n=2992 adults) using wearables and compared sleep metrics to self-reported sleep disturbance and impairment.
Methods: Participants in the Digital Wellbeing Study wore one of several wearable devices (Fitbit) capable of tracking objective sleep metrics such as Total Sleep Time (TST), bedtime, wake-up time, estimated sleep stage durations etc. over a 4-week period under normal free-living conditions. Self-reported sleep questionnaires were administered at enrollment and at study-end. The wearable-derived objective sleep metrics were summarized across the 7 days prior to administration of the study-end PROMIS Sleep Disturbance (SD) and Sleep-Related Impairment (SI) Short Form surveys. Stepwise Ordinary Least Squares (OLS) regressions were then used to test the predictive power of the objective sleep metrics to estimate the raw survey scores (and compared to predictions from a baseline model of age and sex only).
Results: Sleep variables of TST, resting heart rate, and the variability in total sleep time and restlessness improved both SI and SD above the baseline model. Minutes-in-deep-sleep improved the SI model fit, while longest wake length and total wake minutes improved SD fit. REM percent and normalized nightly heart rate did not improve model fit. The final model combining the set of objective sleep metrics explained 12.9% of the variance of SI (+4.2% over baseline), and 8.4% of the variance of SD (+6.0% over baseline). The most predictive single sleep metric was the variability in total sleep time for SI, and total sleep time for SD.
Conclusion: Previous studies using polysomnography (PSG) or actigraphy derived objective sleep metrics found only modest predictive power of self-reported sleep satisfaction measures (e.g., correlations of 0.3-0.46). This study showed that longitudinal free-living sleep data from wearables provided a similar moderate level of prediction for two self-reported sleep questionnaires. Composite metrics that include measures of sleep variability may provide some additional insight into sleep-related impairment.
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0304

ATTITUDES TOWARDS MOBILE TECHNOLOGIES FOR SLEEP AND CIRCADIAN HEALTH PROMOTION AMONG MILITARY PERSONNEL

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Introduction: Mobile technologies, including wearable devices and mobile apps, have been widely promoted as potentially effective tools for the assessment and improvement of sleep and circadian health in populations at high risk for circadian disruption, such as military personnel. However, little research has been done to assess the perceived utility of these technologies within this population. The purpose of this study was to qualitatively assess attitudes towards the use of mobile technologies for the promotion of sleep health among active duty service members.
Methods: Five focus groups were conducted with active duty Marines (N = 30; 90% male, 10% female) as part of a needs assessment designed to identify current sleep-related needs and potential intervention approaches. Focus group transcripts were analyzed by two independent coders using applied thematic analysis to identify and interpret salient themes.
Results: Many participants reported currently using wearable devices capable of providing data on sleep health, including Apple watches and Fitbits, and some reported using popular sleep-focused apps. Despite the current use of these technologies, participants expressed ambivalence about future interventions that exclusively relied on apps or wearables to promote sleep and circadian health. Instead, participating Marines reported a desire for other approaches for promoting sleep health, with many describing a preference for in-person, small-group education sessions led by civilian facilitators. Participants reported that education sessions may increase motivation among Marines to improve their sleep hygiene behaviors or provide instruction on how to maximize the utility of wearable devices (e.g., "If they already have the smartwatch capability and you say, 'Hey, this would be an excellent tool.' I think that gives them some sort of metric to compare themselves to.") Additionally, participants expressed a desire for organizational efforts to improve sleep health, including leadership training and scheduling interventions.
Conclusion: Study results indicate that wearables and other technological interventions for sleep may be acceptable among active duty Marines, but that they must be accompanied by other strategies to maximize their effectiveness in this population.
Support (if any):

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0305

CAN WE RELY ON WEARABLE SLEEP-TRACKER DEVICES FOR FATIGUE MANAGEMENT?

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Introduction: The importance of sleep in daily life and advancements in our ability to measure bio-signals have led to an unprecedented growth in the use of commercial wearable sleep-tracker devices. However, sleep parameters estimated from these tracker devices often differ from the gold-standard polysomnography (PSG). It is unclear to what extent we can tolerate these errors within the context of a particular clinical or operational application. Here, we sought to develop a method to quantitatively determine whether a sleep tracker yields acceptable sleep-parameter estimates for assessing alertness impairment.
Methods: Using literature data, we characterized sleep-measurement errors of 18 unique sleep-tracker devices with respect to PSG. Then, using predictions based on the well-validated Unified Model of Performance, we compared the

temporal variation of alertness for simulations with and without added PSG-device sleep-measurement errors, for nominal schedules of 5, 8, or 9 hours of sleep/night, or an irregular sleep schedule each night, for 30 consecutive days. Finally, we deemed a device error acceptable when the predicted differences were smaller than the within-subject variability of 30 ms.

Results: On average, the 18 sleep-tracker devices overestimated sleep duration by 19 (standard deviation = 44) minutes. Using these errors for 30 consecutive days, we found that, regardless of sleep schedule, in nearly 80% of the time the resulting predicted alertness differences were smaller than 30 ms, suggesting that most devices yield acceptable sleep-measurement errors. We also established the capability to estimate the extent to which a specific sleep-tracker device meets this acceptance criterion.

Conclusion: We provide a method to quantitatively determine whether a sleep-tracker device produces sleep measurements that are operationally acceptable for fatigue management.

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0306

IMPROVING ACCESSIBILITY AND MINIMIZING ERRORS: RELIABLE SLEEP STAGE CLASSIFICATION USING WEARABLE SENSORS

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Introduction: The widespread use of wearable devices has led to the emerging trend to quantify sleep. However, concerns arise due to the potential inaccuracies in these devices, which even can result in adverse daytime consequences. Here, we present an automatized, low-cost, deep learning alternative to PSG sleep staging that provides a reliable epoch-by-epoch classification in four classes (Wake, Light [N1 + N2], Deep, REM) and solely relies on inter-beat-interval (IBI) HRV data.

Methods: We trained a multi-resolution convolutional neural network (MCNN) on the IBIs of 8898 manually sleep-staged full-night (PSG) recordings and tested the MCNN for classification accuracy using two affordable consumer wearables: an optical heart rate sensor using photoplethysmography (PPG-VS) and an ECG breast belt (H10). Our most recent study tests the model on 136 self-reported poor sleepers equipped with PSG and these wearables.

Results: Results indicate promising outcomes with high epoch-by-epoch accuracy for ECG (accuracy: 86.3%, $\kappa = 0.79$), the H10 ECG (84.4%, $\kappa = 0.76$), and the PPG-VS wearable (84.2%, $\kappa = 0.75$). The HRV-based model exhibits substantial correlations and agreement with PSG on key sleep parameters, e.g., for Sleep Onset Latency ($\rho = 0.82$, $p < 0.001$), Sleep Efficiency ($\rho = 0.84$, $p < 0.001$), Total Sleep Time ($\rho = 0.94$, $p < 0.001$) and REM sleep ($\rho = 0.78$, $p < 0.001$). Notably, the model accurately classifies sleep also among users on heart-affecting or psychoactive medication; a critical aspect for potential clinical use. A first RCTs using this algorithm in our App "Nukkuaa" tested effects of i) daily objective sleep feedback using such sensors in combination with ii) tailored sleep training for insomnia patients using digital cognitive behavioural therapy (dCBT-I) and revealed subjective as well as objective improvements.

Conclusion: The present validation underscores the potential of automatic sleep stage classification algorithms based on cost-effective wearables and paves the way for scientific and clinical applications which strive for continuous and reliable sleep measurements including epoch-by-epoch sleep stage information as known from traditional PSG.

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0307

CORRELATIONS BETWEEN SUBJECTIVE AND OBJECTIVE ESTIMATIONS OF SLEEP QUANTITY AND QUALITY FROM WEARABLE DEVICES

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Introduction: Beyond sleep quantity, another important factor for health and performance is sleep quality. While sleep quantity is reliably measured with objective methods like actigraphy, sleep quality is typically only assessed via subjective report, so it is still debated whether it can be estimated objectively. Many new-generation wearable devices have been found to equal or outperform actigraphy in sleep/wake measurement, but whether their estimates of sleep quantity or quality also correlate with subjective sleep estimates/ratings has yet to be established. Therefore, we explored whether subjective estimates/ratings of sleep (total sleep time [TST] and sleep quality) were correlated with objective estimates provided by commercial wearable devices.

Methods: In total, 33 healthy young adults participated in week-long home sleep studies. In Study 1, participants (n=21) habitually slept at night using a device set including Philips Respironics Actiwatch 2, Fatigue Science ReadiBand, Fitbit Inspire HR, Polar Vantage V Titan, and Oura Ring (OR). In Study 2, participants (n=12) with habitual irregular sleep schedules (i.e., some naps/daytime sleep) used a device set including Actiwatch 2, Garmin Fenix 7, and OR. For all sleep episodes, participants wore their devices and completed sleep diaries. Pearson correlations were calculated between devices and diaries for TST, and for sleep quality scores (0–100) from the OR algorithm compared with diary, Likert-type sleep quality ratings (1–5). P-values <.05 were considered statistically significant.

Results: Correlations between subjective and objective TST were significant for all devices. Likewise, OR sleep quality scores significantly correlated with subjective sleep quality ratings.

Conclusion: This analysis provides initial evidence for relationships between objective estimates of sleep quantity and quality from commercial wearable devices and subjective estimates/ratings from sleep diaries in healthy adults. While TST had previously been known to correlate between actigraphy and diaries, this had not been extensively tested in commercial wearables. Additionally, we found these relationships extended to OR's sleep quality score. Such proprietary "sleep quality" scores are often the primary sleep-tracking metric displayed from new-generation wearables; however, scores are proprietary and without actigraphy equivalents. More testing is needed to explore whether these relationships extend to other populations/settings.

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0308

NON-CONTACT SLEEP MONITORING WITH A DEPTH CAMERA: MORPHOLOGY SIMILARITY BETWEEN A TOUCHLESS FLOW SIGNAL AND RIPFLOW

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Introduction: We have developed a non-intrusive sleep monitoring technology based on data from a commercially available depth sensing camera [Intel RealSenseTM D415, Intel, Santa Clara, CA]. This non-contact, or touchless, technology allows continuous respiratory monitoring without attaching probes to the patient. We have noticed a strikingly similar morphology between the touchless flow signal, NCMflow, derived from the depth camera and the RIPflow signal derived from the chest and abdomen respiratory inductance plethysmography (RIP) bands. Here we report on a preliminary quantitative assessment of this morphological similarity between the two signals.
Methods: For this proof-of-principle study, we analyzed a patient data set acquired continuously during a 9-hour sleep study at the Sleep | Wake Center at the University of Utah, where informed consent was given. Depth data was acquired with the depth camera placed approximately 1.1m above the torso of the patient. A patient with severe sleep apnea (AHI of 74/hr) was selected to compare NCMflow and RIPflow, and we examined both the concordance and the Pearson coefficient, which are measures of the mutual trending and linear correlation between the two signals respectively. The concordance was examined in two distinct timescales (1 and 2 seconds), which allowed for intra-breath morphology analysis, using a data exclusion zone of 10% to account for background signal noise. Both concordance and Pearson coefficient of linear correlation were calculated over the full 9 hours of the sleep study (including sleep and wake periods).
Results: The concordance for timescales of 1 and 2 seconds were 0.93 and 0.95 respectively, (where complete concordance would equal 1.00 and correspond to perfect co-trending). The corresponding Pearson R value was 0.90, (out of a maximum achievable value of 1.00 corresponding to perfect linear correlation between the signals).
Conclusion: The high values of the concordances and R confirm the excellent match we observe visually between the touchless flow signal, NCMflow, and the RIPflow signal. Our findings strongly support the potential for non-contact continuous monitoring of respiratory disturbances during sleep based on a depth camera system. Future work will aim to determine the viability of developing a touchless sleep scoring methodology.
Support (if any): The work was funded by Medtronic.

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0309

CONCORDANCE IN ELECTROENCEPHALOGRAPHY-HEADBAND VERSUS POLYSOMNOGRAPHY BY DEMOGRAPHICS AND COGNITIVE STATUS

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Introduction: Polysomnography (PSG) can be burdensome and alternative measures are needed to advance sleep research. We previously reported that a novel electroencephalography (EEG)-headband outperformed actigraphy when compared to PSG among older persons with sleep complaints. The current study examined the concordance of the EEG-headband with PSG, and variations in concordance by gender, race, and cognitive status.
Methods: Sixty community-living adults ≥60 years with self-reported sleep complaints completed a 7-day home-based sleep protocol with a novel EEG-headband (Beacon Biosignals) and one night of home-based polysomnography (NOX-A1 Sleep System). We evaluated the concordance of total sleep time [TST] and wake after sleep onset [WASO] between PSG and the EEG-headband using paired t-tests and two-way mixed effects intra-class correlation coefficients (ICC). We examined variations in concordance by gender, race, and the presence of mild cognitive impairment [MCI] (< 13 on the Montreal Cognitive Assessment short form) using Fisher Z-transformation to assess between-group differences in ICCs.
Results: Mean age was 74 years, 65% were women, 33.3% were people of color, and 35% had MCI. The EEG-headband showed excellent concordance with PSG when measuring TST (absolute difference -9.14 minutes [95% Confidence Interval -23.17, 4.89]; ICC= 0.83 [0.73, 0.89]) and good concordance when measuring WASO (absolute difference -17.11 [-13.71, -2.50]; ICC= 0.64 [0.47, 0.77]). Concordance in TST was significantly different between men and women (ICCs of 0.91 vs 0.67, respectively; p=0.01), but did not vary by race and cognitive status. Concordance in WASO did not vary by gender, race, or cognitive status.
Conclusion: Among community-living older adults with sleep disturbances, the EEG-headband showed good to excellent concordance with PSG when measuring TST and WASO. The EEG-headband is an acceptable alternative to PSG, including among people of color or persons with MCI. Reduced concordance in TST among women may have been due to differences in fit and/or contact of the headband with the scalp.
Support (if any): NIA (K76AG0749505, R03AG073991, P30AG021342)

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0310

MULTI-CENTER EVALUATION OF A USER OPERABLE EEG BASED AUTOMATED SLEEP MONITOR

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Introduction: Sleep pathology is increasingly being recognized in many neuropsychiatric conditions, including those not traditionally associated with sleep medicine. Improved therapeutic strategies will benefit from EEG-based sleep analytics, but EEG is limited by cost and availability. Here we evaluate the performance and usability of a user operated dry-EEG electrode-based sleep monitoring headband (the Dreem 3S, D3S), which is intended to provide detailed brain EEG activity with automated sleep staging and longitudinal recording ability from the home environment.

Methods: Two prospective studies included 60 subjects who underwent either one overnight in-lab traditional polysomnography (PSG) while concomitantly wearing the D3S, or three nights at home with the D3S. At home, subjects self-applied the D3S. Device usability and automated sleep staging performance were evaluated.
Results: Overall agreement between D3S and PSG scoring was 85.6% across sleep stages. Intra Class Correlation (ICC) for Total Sleep Time (TST), Sleep Efficiency (SE), Latency to Persistent Sleep (LPS), and Wake After Sleep Onset (WASO) exceeded 90%, indicating excellent agreement between D3S and PSG. ICC ranged from 65% to 86% for automated machine learning interpretation of time spent in N1, N2, N3, and REM, comparable or superior to other devices and individual human performance. Usability evaluation demonstrated safe and comfortable use of the device in the home setting, with a System Usability Score (SUS) score of ≥ 68. Subjects were able to operate and record 2-3 nights of high-quality data without additional support or technologist intervention. Furthermore, 96.6% of each record was deemed to be of sufficient EEG signal quality to enable manual expert review.
Conclusion: The Dreem 3S provided accurate sleep-staging and sleep metrics from EEG data acquired in conjunction with in-lab PSG or multiple nights in the home setting. Results were comparable to in-lab PSG results. D3S therefore offers objective EEG-based sleep investigation that is not feasible with traditional PSG, such as longitudinal data acquisition in a patient's home environment without need for expert technologist applications. Such technology enables expansion of EEG-based sleep analysis for novel conditions.
Support (if any): This work was supported by Beacon Biosignals, which is a private company with ownership of the D3S.

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0311

ARTIFICIAL INTELLIGENCE (AI) TO PREDICT AROUSALS IN HOME SLEEP TESTING (HST) WITHOUT ELECTROENCEPHALOGRAPHY (EEG)

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Introduction: The American Academy of Sleep Medicine recommends scoring hypopneas terminating in either oxygen desaturation or arousals. A limitation of HST, when EEGs are unavailable, is not scoring hypopneas that terminate in arousals. This lowers the average apnea-hypopnea index (AHI) in HST studies and disproportionately affects patients who predominantly have hypopneas that terminate in arousals.
Methods: We report on a deep neural network, Nox BodySleep 2.0 experimental prototype, that predicts arousals and sleep stages using non-EEG signals. The model uses abdomen and thorax respiratory inductance plethysmography (RIP) and activity signals. The model outputs arousal events; and Wake, rapid-eye-movement (REM), and non-REM sleep epochs. It was trained on ~3200 PSG sleep studies from the United States, Europe, and Asia, and validated using 2,407 PSGs from clinical sleep labs in the United States. The performance was measured using epoch-based sensitivity, specificity, and accuracy for scoring arousals. Furthermore, the clinical performance was validated by the sensitivity, specificity, and accuracy for AHI severity classification for the diagnostic cutoff thresholds of AHI ≥ 5 and AHI ≥ 15.
Results: The model sensitivity, specificity, and accuracy was 65%, 85%, 80% for arousal scoring. For AHI ≥ 5, the sensitivity, specificity, and accuracy were 95%, 88%, 94%, respectively. For AHI ≥ 15, the results were 86%, 97%, 92%. When the sleep studies were scored as HST without using the model, the corresponding results for AHI ≥ 5 were 75%, 95%, 77%, and for AHI ≥ 15, 60%, 99%, 81%. When the studies were scored as PSG, the results for AHI ≥ 5 were 96%, 95%, 96%, while for AHI ≥ 15, they were 89%, 98%, 96%.
Conclusion: The model is a promising method of providing conclusive results from HST sleep studies. The model-based AHI is closer to the AHI from a PSG than when using HST. The AI model was trained on a large and diverse dataset and validated on a clinical population from the United States. Predicting arousals in HST studies without EEG improves patients' access to conclusive sleep apnea testing, and may improve health equity and the operation of sleep clinics.
Support (if any): None

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0312

AN AT-HOME, WIRELESS, SLEEP MONITORING SYSTEM FOR LONG-TERM, RELIABLE SLEEP ASSESSMENT IN YOUNG AND OLDER ADULTS

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Introduction: Poor sleep quality increases from middle age onward with impacts on cognition, most notably episodic memory, and is associated with an increased risk of Alzheimer's disease (AD). There is great interest in determining if sleep quality, and what specific neural features thereof, may serve as a non-invasive biomarker of memory decline and AD. Constraints of "gold standard" polysomnography assessments of sleep's neural architecture, including bulky, wired, rigid, expensive, and uncomfortable equipment either in a lab or at home, make collecting multiple nights of sleep data prohibitive. As night-to-night sleep variability predicts poorer cognition, it is essential to sample multiple nights from the comfort of home. Existing wearable devices enable sleep monitoring at home but remain bulky and rigid, or offer poor signal quality and inaccurate sleep analysis.
Methods: We deployed, in cognitively unimpaired young (age 18-36) and older (ages 60-74) adults, our recently developed and validated, inexpensive, gel-free, nearly weightless, sleep monitoring patch that uses soft, skin-conformable self-adhesive materials containing multiple laser-cut electrodes, self-applied to the face for optimal usability and comfort.
Results: Participants reported being easily able to self-apply the reusable sleep patch and operate the Bluetooth tablet-based data acquisition software throughout seven nights. Manual scoring and automated classification-based scoring showed high agreement across all sleep stages (82.43%, kappa value = 0.74). Signal-to-noise estimates of slow wave activity (0.5-3.75 Hz) show remarkable stability over the 7 nights in both young (SNR range 26.71 dB-33.42 dB, Cronbach's alpha 0.797) and older (SNR range 26.27 dB-28.42 dB, Cronbach's alpha 0.846) adults, comparable to estimates obtained from optimal conditions in our

university sleep lab. Consistent with results from polysomnography, older adults showed reduced slow wave (N3) sleep (Young: 7.13 %; Older: 2.88 %).
Conclusion: This study validates that the high comfort, wearable patch can measure physiological sleep data at the level of clinical standards in adults across the lifespan. Future work will use this system to assess sleep-dependent consolidation across ages from the comfort of one's home and measure sleep variables longitudinally to identify those most indicative of cognitive decline.
Support (if any): This work was supported by the Alzheimer's Association # FA00000633 and NIA # R21AG064309

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0313
ANALYSIS OF OBJECTIVE AND SUBJECTIVE SLEEP METRICS AND SMARTPHONE USAGE PATTERNS

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Introduction: The Digital Wellbeing Study is an IRB approved joint study between the University of Oregon and Google to investigate how smartphone usage interacts with objective and subjective parameters of well-being such as sleep, exercise and stress. The study recruited a demographically diverse population who each wore a smartwatch and installed a smartphone app linked to the study. Participants completed demographic and health questionnaires including the PROMIS Sleep Disturbance (SD) Short Form. Aims of the study included (a) whether objective sleep duration was correlated with smartphone use, and (b) whether smartphone usage could predict the subjective self-reported sleep instrument.
Methods: There was sufficient data from 7,499 users to conduct a population modeling analysis. An Ordinary Least Squares linear model was used as a predictor of each subject's average total sleep time (TST) and their SD t-score. The inputs to the model included demographics, and population z-scored activity measures (steps, sedentary time, time driving, time at work, home and other locations, phone screen time, frequency of phone unlocks) over seven days prior to the survey.
Results: The activity measures and baseline demographics could only explain a small amount of the overall variance in TST and SD (R^2=0.04 for TST and R^2=0.05 for SD). Phone screen time was a statistically significant predictor of both TST (-8.19 mins, $p < 0.001$) and self-reported sleep disruption (0.611 t-score units, $p < 0.001$). The number of phone unlocks was a predictor of variability in TST (-3.33 mins, $p < 0.001$) suggesting that longer session times are correlated with greater TST variability. The effects are minimal (e.g., a subject who has one standard deviation greater phone screen time than average would be predicted to only see a 2% reduction in TST, and a 0.6% increase in perceived sleep disturbance). Time driving and step count were also minor predictors of SD and TST.
Conclusion: At a population level, average activity measures from wearables and smartphones such as steps, smartphone usage time, sedentary activity etc. are limited predictors of objective sleep metrics such as Total Sleep Time, and subjective sleep metrics such as the PROMIS Sleep Disturbance t-score.
Support (if any): This research was funded by Google Inc.

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0314
DESIGN OF A CONTINUOUS MELATONIN MONITORING SYSTEM: A NEEDS ASSESSMENT FOR DIRECT AND INDIRECT USERS

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Introduction: Circadian misalignment can interact bidirectionally with existing chronic conditions, especially those affecting the physical-cognitive boundary, in a manner causing progressive degradation of the chronic condition and circadian health. Current techniques for detecting circadian misalignment involve salivary, serum, or urinary melatonin testing or applying machine learning to accelerometry and heart rate data from wearable devices, and have considerable limitations affecting accessibility, generalizability, and real-time intervention. A continuous, patient-facing melatonin monitoring device (CMM) offers an alternative detection method while also supporting patients in performing real-time self-care tasks to improve their circadian alignment, sleep health, and wider health outcomes. Systematic design processes emphasize the importance of identifying end-user needs to derive specific design system requirements.
Methods: Three relevant frameworks were to support a process for stakeholder needs assessment to improve circadian / sleep management. Diffusion of innovations addresses factors that impact the adoption of an idea or product through social networks. Health literacy framework references patient knowledge and beliefs that influence health behaviors and outcomes. The chronic care model considers community and health system factors affecting interactions between patients and provider teams. These frameworks were adapted to a sleep health context and used to develop the NAP-CART (Needs Assessment Protocol for a Circadian Assessment and Realignment Tool).
Results: The NAP-CART involves performing semi-structured interviews with direct users (patients) and indirect users (sleep researchers and clinicians), with 15-20 subjects of each. Patient interviews using interface drafts will focus on health literacy specific to circadian alignment and melatonin, user interaction preferences for both short-term and sustained use, including broader issues of health management. Inclusion of indirect users will inform device use for research or clinical settings, but also provider interactions with patients specific to melatonin data, as patients are unlikely to have had previous interactions with melatonin data. Indirect user interviews will also consider the prospective role of CMM in research, clinical care, and decision-making support.
Conclusion: User-centered needs assessments for NAP-CART go beyond technical design of the CMM physical sensor. Incorporating end-user needs, previous experiences, and preferences into the systematic development of specific, measurable design requirements facilitates both initial adoption and sustained use for patients and clinicians.
Support (if any):

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0315
EXPLORING AHI VARIABILITY ACROSS NIGHTS: INSIGHTS FROM WEARABLE TECHNOLOGY IN PATIENTS WITH NO OR MILD OSA

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Introduction: Night-to-night variability (NtNV) of obstructive sleep apnea (OSA) severity is a widely recognized phenomenon in sleep testing. Studies suggested that 20% of patients with mild-to-moderate OSA may be misdiagnosed or misclassified on the first night. Multiple-night assessments utilizing wearables may present a convenient approach to enhance the reliability of OSA estimation. The Belun Sleep System (BLS-100, a.k.a., Belun Ring) is an FDA-cleared, deep-learning-powered home sleep apnea testing system. This analysis aims to assess the NtNV of Belun apnea-hypopnea index (bAHI, events/h) in subjects with no or mild OSA.
Methods: Participants were recruited from a dental school orthodontic clinic for multiple-night Belun Ring (BR) testing. The bAHI was derived for each night, and a reference bAHI was computed based on the mean from all nights. Linear mixed-effects (LME) models were employed to evaluate differences between night-specific bAHI (1st, 2nd, 3rd night, etc) and the reference bAHI.
Results: Thirty-six patients underwent BR testing, with 30 completing ≥3 nights with ≥60 mins/night. Analysis was conducted on 28 subjects with no or mild OSA: age 31.7; 73% female; BMI 24.6; average 6.5 nights (3-10); mean total sleep time 340.0 mins; average AHI 6.2; 46% no OSA and 54% mild OSA. No significant differences were observed between the first night bAHI and the reference bAHI (6.8 vs. 6.2, P=0.362). This trend held true for subgroups with no OSA (3.9 vs. 3.6, P=0.712) and mild OSA (9.3 vs. 8.5, P=0.716). The first night study misclassified 4 (14%) subjects, including 3 (10%) non-OSAs as mild OSA and 1 (4%) mild as moderate OSA (κ=0.72, P< 0.001). While the number of assessment nights was non-significant in NtNV (LME, P=0.618), a drop in misclassification from 14% to 4% after 4-night (κ=0.92, P< 0.001) suggested that a 4-night evaluation may offer a more dependable bAHI assessment.
Conclusion: This research marks the first exploration into the AHI NtNV utilizing wearables in subjects with no or mild OSA. No significant bAHI differences were observed across the nights. A 4-night assessment may provide a more reliable OSA estimation within this particular population. Further investigation into AHI NtNV utilizing BR in moderate-to-severe OSA is warranted.
Support (if any):

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0316

REAL-TIME DETECTION OF OXYGEN DESATURATION USING ELECTROENCEPHALOGRAM SIGNALS

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Introduction: Existing sleep apnea identification methods require polysomnograms, requiring patients schedule the exam and to sleep with many sensors attached to their body. Oxygen desaturation occurs during sleep in patients with sleep apnea, leading to poor rest and other significant complications. Existing work shows the potential of EEG signals as indicators of sleep apnea, identifying a correlation between EEG signals and sleep apnea diagnosis. However, further work is required to understand how blood oxygenation correlates with features in the brain. Recent advancements in signal processing allow EEG signal analysis to identify oxygen desaturation events in real time.
Methods: We leverage EEG signals from polysomnogram studies included in the Nationwide Children's Hospital Sleep DataBank (NCHSDB) dataset for this study. We first break the data into 30-second epochs, then label epochs where the oxygen desaturation event (< 90% SpO2) encompasses all 30 seconds of the epoch as epochs containing desaturations. We furthermore label all epochs where no oxygen desaturation occurs as epochs without desaturations. We perform short-term Fourier transforms on each epoch of EEG data. We randomly select a training set of 20 subjects and a testing set of 20 subjects, different for each sleep state (NREM1, NREM2, NREM3, REM). We then train a ResNet based deep learning network on these EEG signals to predict which epochs contain an oxygen desaturation and which epochs do not contain an oxygen desaturation.
Results: Our model obtains a test balanced accuracy of 77.1% for NREM1 sleep, 58.9% for NREM2 sleep, 80.1% for NREM3 sleep, and 71.0% for REM sleep.
Conclusion: Our results indicate that machine learning models can identify a correlation between oxygen desaturation from EEG signals alone, indicating a potential biomarker for real-time identification of oxygen desaturation from neural signals. This provides a step towards easier identification of sleep apnea, requiring fewer sensors than a traditional polysomnogram.
Support (if any): NCH Sleep DataBank was supported by the National Institute of Biomedical Imaging and Bioengineering of the National Institutes of Health under Award Number R01EB025018. The National Sleep Research Resource was supported by the U.S. National Institutes of Health, National Heart Lung and Blood Institute (R24 HL114473, 75N92019R002).

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0317

ADVANCING HOME SLEEP TESTING: A COMPARATIVE ANALYSIS OF TYPE 2 NEW HST TECHNOLOGY VS. IN-LAB PSG VALIDATION STUDY

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Introduction: Currently, a typical home sleep test only measures respiratory signals, not actual sleep. Therefore, results may be inconclusive or false. Current practice also allows for one-night sleep study at home, that may also affect the results and render them inconclusive. Given these limitations, there is a growing need for a more convenient, accurate, and cost-effective method to diagnose sleep disorders at home. The method should allow patients to connect by themselves to the device at home and allow remote real-time monitoring. It should also provide the possibility for a study that spans over several nights.
Methods: Forty seven adults (mean ± SD age 52.2 ± 12.8 years, 19% females, body mass index 29.4 ± 5.3 kg/m2) used the DormoTech V-lab and simultaneously underwent a full PSG test using the Nox A1 system (K192469). Quantitative methods such as Bland–Altman plots, correlation analysis, and Passing-Bablok regression analysis were used to assess the extent of agreement between the Nox device and the Vlab device. The tests were manually scored based on recommended guidelines.

Results: The mean ± standard deviation apnea-hypopnea index (AHI) was 21.72 ± 24.17 events/h on the Vlab device, 21.50 ±23.86 events/h on in-laboratory PSG NoxA1 system with a p-value of 0.732. Bland-Altman analysis of AHI showed a mean difference of −0.193; the limits of agreement were −7.209 to 6.823 events/h. High agreements across the AHI severity levels. Precision, recall (equivalent to sensitivity), and F1-scores ranged from 0.88 to 1.00, indicating high accuracy and reliability. The correlation coefficients are predominantly above 0.9. Similar results were obtained for the secondary endpoints, with no statistically significant differences and high correlation. no safety event occurred.
Conclusion: There is a substantial consistency across the Vlab, and the selected PSG device in capturing various sleep metrics. This consistency is substantiated by robust statistical analyses. In essence, the high level of agreement between these devices sets a strong foundation for their reliability and consistency in sleep diagnostics. The Vlab is deemed substantially equivalent to the reference device NOX in terms of safety, usability, and efficacy.
Support (if any):

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0318

ALGORITHMIC IDENTIFICATION OF SPACE-TIME PROFILES OF SLOW OSCILLATIONS: DATASET CONSTRAINS AND USE EXAMPLES

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Introduction: Given the importance of sleep oscillations in cognition and health, we introduce a data-driven method to analyze slow oscillations (SOs, 0.5-1.5 Hz) as events that differentiate in their space-time co-emergence on the electrode manifold. This approach has identified properties of SO organization that are relevant to function, and that can change in clinical populations. This study formalizes this technique by parameterizing its domain of applicability in terms of dataset properties (e.g., number of participants (N), density of electrodes in the acquisition cap (E)). We define strategies to conduct parameterization of the algorithm and identify the minimum dataset properties required for successful identification of different SO profiles (i.e., Global, Local and Frontal SOs).
Methods: We apply our algorithm to three datasets of healthy young adults: Set1 (N=22, E=58) and Set 2 (N=34, E=24) with nighttime sleep, Set 3 (N= 54, E=24) with daytime sleep (naps). Set 3 showed a count of SOs comparable to Set2. SOs were detected at each channel separately. Role of electrode density was tested by down-sampling Set1 to 24 and 8 channel conditions and Set2 to 8 channels, reflecting standard caps, and assessing the confusion matrix in relation to the full montage. Sample size was tested by randomly selecting subsets of 22 participants from Set2 ten times, and comparing outcomes to original dataset labels. Daytime vs nighttime sleep was evaluated comparing outcomes for Set3 to outcomes of truncating Set1 and Set2 sleep 90 minutes after the first detected SO. Percentages of SO of each type were related to demographics (age, sex) in scatterplots.
Results: We found that identification of SO space-time profiles required at least 22 participants and at least a 24 head-electrode montage, whereas 8 head-electrodes configurations, typical of clinically acquired sleep, were not sufficient. Daytime sleep did not show Global, Local, Frontal SO profiles, while early nighttime sleep did.
Conclusion: This study introduces an open-access code to promote the investigation of SO space-time organization, describing its domain of applicability and exploring the role of demographics in SO profiles. Algorithmic outcomes for daytime sleep suggest a potential role of sleep pressure in shaping SO profiles.
Support (if any):

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0319

USING GENERATIVE AI AS A TOOL FOR SIMULATING EEG DURING NOCTURNAL POLYSOMNOGRAPHY

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Introduction: Artificial Intelligence based Generative Networks based synthetic data generation has become increasingly popular. Deep Learning Generative models can be trained to model complex data distributions and generate diverse and realistic outputs. We aim to present a generative model that can generate an artificial 30-second epoch of non-REM sleep whose power spectrum is identical to that of a real sleep EEG.
Methods: The data used to train the network was obtained from multiple healthy subjects of the Multi-Ethnic Study of Atherosclerosis (MESA), an NHLBI-sponsored 6-center collaborative longitudinal investigation made available through the National Sleep Research Resource (NSRR). We selected 660 subjects deemed healthy and devoid of any sleep disorders. The EEG was initially recorded at 256 Hz and down sampled to 64 Hz for this study. Only the Fz-Cz channel from the recorded EEG channels was used to train the Generative model. A Deep Learning Generative Adversarial Network was trained using 30s epochs of the NREM Stage 3 EEG data from 660 subjects. Both visual inspection and quantitative metrics were used to evaluate the synthetic signals. The metric to assess Generative Model performance was the relative spectral power (%) in different frequency bands compared to real EEG signals. The averages for the real EEG signals were calculated after taking the average frequency band power across all epochs used for training. The band-power of 100 generated samples, visually deemed good quality, was used to calculate the average for generated EEG signals.
Results: Across Alpha, Delta, Beta, Theta and Sigma bands, there was minimal difference in % band power between synthetic and real EEG signals: Alpha real[0.5±0.14] / Alpha synthetic[2.46±0.52], Beta real[0.1±0.03] / Beta synthetic[0.058±0.03] , Theta real[1.8±0.78] / Theta synthetic[4.18±0.9], Delta real[97.0±1.26] / Delta synthetic[93.2.0±2.25] and Sigma real[0.6±0.04] / Sigma synthetic[0.084±0.01]
Conclusion: The developed system has the potential to be a sleep EEG simulator used as an educational tool to train fellows and technicians across the field of sleep medicine. Future studies are needed to accommodate multichannel EEG signals and other PSG signals (e.g., respiratory, Spo2 etc.) to simulate an entire nocturnal polysomnography.
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0320

FOUNDATIONAL TRANSFORMERS WITH LINEAR PROBING FOR SLEEP STAGE CLASSIFICATION USING TIME SERIES SLEEP STUDY DATA

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Introduction: Sleep disorders and deprivation disrupt people's daily activities, mental health, and longevity and are related to widespread conditions. Currently, sleep disorders are diagnosed via polysomnography (PSG), where electrophysiological data is collected and manually annotated by a clinician. State of the art machine learning (ML) models, such as the transformer, are particularly well-suited for modeling timeseries PSG data. Specifically, self-supervised models with linear probing could assist with any relevant sleep predictive task including automating sleep stage classification, which would save clinicians time, reduce variability in manual scoring, and help scale to treat more people.
Methods: Using a self-supervised learning approach and the transformer architecture, we trained a self-supervised ML model that inputs seven PSG channels of length three hours including electroencephalogram, electrooculogram, electromyography, electrocardiography, oxygen saturation, and thoracic and abdomen respiratory rate using the Sleep Heart Health Study database (1995-1998). The model architecture uses the transformer's attention mechanism to learn long range dependencies between intervals of sleep and a convolutional layer to learn relationships among channels. The model learns representations of PSG data through masked reconstruction with a mean squared error loss function. The representations are used as input into a deep neural network that is trained via linear probing (without adjusting the weights of the transformer model) to classify sleep stages.
Results: 5,794 sleep studies from the Sleep Heart Health Study with at least three hours of relevant PSG sleep channel and hypnogram data are included in training the self-supervised and linear probing models. Area under the receiver operator characters curve for sleep stage classification are 0.960 [0.960-0.961], 0.848 [0.846-0.849], 0.906 [0.906-0.907], 0.968 [0.967-0.968], and 0.931 [0.930-0.932] for wake, stage 1, stage 2, stage 3, and REM, respectively. Hyperparameter tuning, class weighting, and dataset cleaning will be performed to increase classification results.
Conclusion: A self-supervised training approach using the transformer architecture with linear probing was utilized to learn multichannel PSG data representations. These representations were used as input into a downstream model to classify sleep stages accurately. Future work should be done to examine the capabilities of the self-supervised model representations for other predictive sleep tasks.
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0321

LUNA: MERGING OPEN-SOURCE TOOLS, DATA AND MODELS FOR SLEEP SIGNAL ANALYSES

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Introduction: Data-sharing is increasingly recognized as a critical driver of discovery and reproducibility in modern biomedical science. To realize the promise of data-sharing, important corollaries are the need for open tools, standards and models to work with and make sense of those data. Here we outline a new software framework (Luna), which is tightly coupled to data in the National Sleep Research Resource (NSRR) and supports predictive models based on these and other datasets.
Methods: Luna is well-documented, multi-platform open-source software package that supports a variety of analyses of sleep macro- and micro-architecture and is being integrated into the NHLBI BioData Catalyst ecosystem. Web-based Moonlight & Moonbeam components support the direct access, interactive viewing and analysis of NSRR data. We are also developing modular and extensible model-based prediction capabilities in Luna, to predict outcomes such as biological age directly from raw sleep (EEG) signals.
Results: We will present specific results from three exemplar applications of Luna: 1) a sleep stager and biological/brain age prediction model tailored to pediatric contexts, trained on over 5000 individuals, 2) risk models for schizophrenia from high-density sleep EEG data, and 3) sleep-based biomarkers of cognitive aging in older adults. As well demonstrating the performance of these models, we will discuss challenges to validity and interpretation more generally.
Conclusion: The power of open sleep data is greatly augmented by robust tools, standards and models to facilitate working with those data. Greater community-wide sharing and transparency of tools and methods is an important step to greater reproducibility and rigor in sleep science.
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0322

ACHIEVING DEEP SLEEP IN THE MAGNETIC RESONANCE ENVIRONMENT

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Introduction: Polysomnography, which includes Electroencephalography (EEG), is a widely used method for categorizing wake/sleep into four distinct states. However, achieving sleep within the magnetic resonance (MR) environment can be challenging given the associated loud sounds and confining space elements. Protocols designed to support sleep in the MR environment are uncommon but are needed to allow for simultaneous fMRI-EEG recordings.
Methods: This study utilized two comparable cohorts to develop a simultaneous fMRI-EEG protocol to maximize deep sleep in the MR environment. In both cohorts sleep patterns were monitored via actigraphy for one week preceding a magnetic resonance imaging (MRI) session. In cohort 1 (n = 8), participants were instructed to wake earlier than usual, resulting in approximately 3 hours of sleep debt before attempting to initiate sleep in the MR environment. During the scan, participants experienced a looped scan sequence (with a relatively higher frequency than the second cohort) for one hour. In cohort 2 (n = 10), a parallel protocol was followed, but the looped scan sequence was

extended to 1 hour and 40 minutes and the frequency was lower. Additionally, cohort 2 participants underwent 2-3 nights of sleep onset with MR sound recordings directly before their scheduled MRI session.
Results: The two cohorts had distinct sleep architecture differences; wherein, cohort 2 achieved significantly more deep sleep in the MR environment. Cohort 1 participants had 288 (52%), 69 (12%), 122 (22%), and 30 (5%) minutes of Wake, NREM-1, NREM-2, and NREM-3 respectively. Cohort 2 had 202 (24%), 177 (21%), 150 (18%), and 180 (22%) minutes of Wake, NREM-1, NREM-2, and NREM-3 respectively. Given the complexity of the MR environment, unsure and artifact 'uncodable' epochs/minutes were also calculated: cohort 1: 48 (9%) minutes and cohort 2: 121 (15%) minutes.
Conclusion: In both protocols, participants successfully obtained sleep; however, the protocol with sound acclimation and a longer scan sequence resulted in notably higher amounts of deep sleep. Future studies utilizing simultaneous fMRI-EEG measurement would be well advised to follow a similar protocol. As our understanding of brain activity during sleep increases, so will our need to obtain successful simultaneous fMRI-EEG measurements.
Support (if any):

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0323

IS SNORING ASSOCIATED WITH LOWER SLEEP QUALITY? IF YES, DOES THE ASSOCIATION DEPEND ON SLEEP APNEA?

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Introduction: Snoring, as a common manifestation of sleep apnea, has often been used as a surrogate parameter for apnea. Significant associations were found between snoring and daytime sleepiness and cardiovascular conditions. The goal of this research is to use objective sleep data collected by the Sleep Number platform and survey responses to examine the relationship between snoring and sleep quality depending on the presence of treated or untreated apnea.
Methods: An IRB-approved survey, which included demographics and questions about sleep and its associated disorders, was presented to a cohort of Sleep Number (SN) customers during the period between June 12 to 26, 2023. Objective data collected by the SN platform included sleep duration, restful sleep, sleep latency, mean respiration rate, mean heart rate, mean heart rate variability, and sleep quality. The latter considers a demographic dependent aggregation of sleep duration, restful sleep and cardiorespiratory activity. Data were collected May 1st - June 30-2023, and were augmented by survey responses. Four groups were defined for analysis HNS: non-snorers reporting no sleep disorder, HES: snorers reporting no sleep disorders, TAS: snorers with treated apnea, and UAS: snorers with untreated apnea. Analysis of variance (ANOVA) was performed to identify any significant objective data differences between the groups. A second analysis focused on identifying the specific metric showing significant differences.
Results: The demographic responder composition per group was HNS 2454 (1717F/734M) individuals aged 53.9 (SD: 15.0) years-old, HES: 4702 (2626F/2069M) individuals aged 55.1 (SD: 13.5) years-old, TAS: 1784 (679F/1103M) individuals aged 59.7 (SD: 12.0) years-old, and UAS: 134 (59F/75M) individuals aged 59.4 (SD: 10.9) years-old. The ANOVA revealed significant objective data differences between groups. Only sleep quality showed significant group differences. Quality decreased significantly with respect to the HNS reference. Healthy snorers had a 0.96% lower quality, snorers with treated apnea had 1.8% lower quality, and snorers with untreated apnea had 3.9% lower quality.
Conclusion: Compared to healthy non-snorers, sleep quality quantification by a smart bed suggests a gradual decrease for healthy snorers, snorers with treated apnea, and snorers with untreated apnea.
Support (if any):

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0324

LOCALIZING RESPIRATORY EVENTS IN SHORT SIGNAL SEGMENT TO IMPROVE RESPIRATORY EVENT COUNTING

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Introduction: When predicting respiratory events over a short segment (60 seconds) as input to a machine learning model, it is common to divide the full night recording into multiple non-overlapping short segments and count segments containing respiratory events. However, underestimate happens when multiple events exist within a segment, which influences the event counting performance.
Methods: The Stanford Technology Analytics and Genomics in Sleep (STAGES) database was used. Recordings from 332 nights were randomly selected for training and 100 nights for testing SpO2, Instantaneous Heart Rate and red-light PPG envelope were inputs to the one-dimensional CNN model to predict the respiratory events. In the first model, consider 60 seconds non-overlapping segments, where a segment is labeled when there is more than one event. In the second model, consider overlapping segments with 50 seconds overlap, where a segment is labeled 1 if there is more than 1 event in the middle 10 seconds. We then compare these two models.
Results: We trained the models with two methods to obtain similar performance with segment prediction Receiver operator curve to have area under curve above 0.9. In the severe apnea testing group, with the non-overlapping method, we can recover 76% of the event, while with the overlapping method, we can recover up to 97% of the event.
Conclusion: By limiting the label window of an input segment, we can provide a more fine-grained event detection.
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0325

SNORING AND OBSTRUCTIVE SLEEP APNEA ASSOCIATIONS THROUGH THE LENS OF A SMART BED PLATFORM

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Introduction: Snoring and obstructive sleep apnea (OSA) are bidirectionally associated. The majority of OSA patients snore

and a substantial percentage of those who snore have OSA. The intensity and the acoustic properties of snoring in apnea patients have been shown to correlate with OSA presence. The goal of this research is to use objective sleep data collected by the Sleep Number platform and survey responses to examine the relationship between snoring, sleep metrics, demographics, and OSA.
Methods: An IRB-approved survey, which included demographics and questions about sleep and its associated disorders, was presented to a cohort of Sleep Number (SN) customers during the period between June 12 to 26, 2023. Objective data collected by the SN platform included sleep duration, restful sleep, sleep latency, sleep quality, mean respiration rate, mean heart rate, and mean heart rate variability. Data were collected May 1st - June 30-2023, and were augmented by survey responses to examine associations between apnea presence, snoring properties, and objective data.
Results: Out of 22048 (12476F/9537M) respondents with mean age 55.8 (SD: 14.1) years, 3163 reported a diagnosis of apnea and 10558 reported no sleep disorder. Snoring was reported by 89.9% and 65.2% of the apnea and healthy sleepers, respectively. Among the respondents who snored, 29.2% had an apnea diagnosis (apnea and snoring are associated with R2=0.02). A mixed model considering age, gender, reported breathing interruption, snore intensity and frequency as predictors and apnea as the dependent variable resulted in a higher R2 = 0.19. The addition of objective data collected by the smart bed increased the R2 = 0.53. A logistic regression model using demographics, snoring properties, and objective metrics as independent and apnea presence as dependent variables, was trained and tested with the data from 80% and 20% of the individuals respectively. This model resulted in 0.91 area under the receiving operator curve, and 84% sensitivity and 90% specificity to detect apnea.
Conclusion: Objective data from a smart bed combined with demographic and snore properties can be used to screen apnea risk. This research is limited by the absence of information about apnea severity.
Support (if any):

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0326

UNOBTRUSIVE DETECTION OF HEART-RATE-DIPPING DURING SLEEP BASED ON FORCE SENSORS IN A SMART BED

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Introduction: Typical heart rate (HR) during sleep exhibits a dipping pattern whose absence is associated with increased risk of all-cause mortality and cardiovascular events. Unobtrusive and longitudinal monitoring of HR patterns may be valuable for early detection of cardiovascular risk. We developed a high-temporal coverage algorithm to estimate instantaneous HR enabling characterization of HR patterns using data from a smart bed.
Methods: Seventeen smart beds were equipped with force sensors under each leg. The force signals acquired at 250 Hz from the sensors located at the bed's top on the user side were filtered in the 0.5 to 40 Hz band and subsampled to 100 Hz. The data from 226 sleep sessions from 9 participants (5M/3F), mean age 41.7 (SD: 11.3) years-old, were used to train a deep neural network to estimate instantaneous HR every second using data from a 15-second rolling window. The reference HR value was obtained from a Zephyr BioHarness device. The data from 33 sleep sessions from 8 subjects (6M/2F), mean age 41.0 (SD: 11.8) years-old were used to estimate HR, the lowest HR and the latency thereof. The reference HR was obtained from an in-home PSG device (Cerebra). A technician performed the sleep staging and event annotation. The accuracy of estimating instantaneous HR was quantified using a Bland-Altman (BA) analysis at the epoch (30 seconds) level. We defined temporal coverage as the fraction of epochs with HR estimation accuracy ≥ 90%. The HR dipping value was obtained from a smoothed version of the instantaneous HR curve. The HR dipping value and its latency for the ground-truth and the estimated instantaneous HR were compared using BA analysis.
Results: The limits-of-agreement (LoA) for instantaneous HR estimation were [-7.31 to +7.74 beats/min]. The mean coverage across sleep sessions was +92.6 %. The LoA for the minimum HR estimation were [-1.48 to +3.09 beats/min]. The LoA for the minimum HR latency were [-2.28 to +1.79 minute].
Conclusion: Force sensors under a smart bed legs enable accurate and high-temporal coverage HR estimation. This was tested in an HR dipping estimation application resulting in a tight LoA of 4.57 beats/min.
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0327

RU-SATED 4.0 MULTIDIMENSIONAL SLEEP HEALTH SCALE AND BEHAVIORAL DATA FROM SLEEP NUMBER SMART BED SYSTEMS

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Introduction: Objective sleep patterns can be measured unobtrusively using instrumented "smart" bed systems, which offer an innovative method to record and evaluate behavioral sleep patterns in people's own homes and over time. However, little is known about behavioral sleep patterns and their relationships with self-reported multidimensional sleep health. We recently developed the Ru-SATED 4.0 Multidimensional Sleep Health Scale. In the present study, we aimed to (1) characterize Ru-SATED and Sleep Number bed behavioral data, and (2) compare behavioral sleep data with self-reported multidimensional sleep health as an indicator of convergent validity for Ru-SATED.
Methods: We enrolled adults (≥18yo), stratified by age, who participate in the Sleep Science Panel run by the Sleep Number Corporation. The panel consists of research volunteers who use a Sleep Number Smart Bed. Participants completed the Ru-SATED 4.0 scale, a self-report past-month measure of 6 dimensions of sleep health (Regularity, Satisfaction, Alertness, Timing, Efficiency, Duration). We evaluated Ru-SATED total scores and individual dimensions in relation to past-month Sleep Number bed behavioral data (sleep session regularity, timing, efficiency, duration) using Spearman correlations.
Results: We included participants with complete self-report and bed data (N=2,915; age range=19-90y, M age=52.6±16.4y, 54.9% female, 81.3% White/Caucasian, 6.3% Black/African American, 4.9% Hispanic/Latinx, 1.9% Asian, 0.5% American

Indian/Alaskan Native, 5.0% Other or Multiple Racial/Ethnic Identities). The average Ru-SATED total score was 15.0±3.5 (range=0.0-24.0; higher scores indicate better multidimensional sleep health). Averages scores on the Ru-SATED individual dimensions ranged from 2.18±1.11 for efficiency to 2.82±1.04 for alertness. The magnitude of correlation between Ru-SATED total scores and bed data variables was strongest for regularity (r=0.26), efficiency (r=0.25), and duration (r=0.12), and was negligible for timing (r=0.01).

Conclusion: Smart bed data collection is a low-burden method for assessing behavioral sleep variables. The Ru-SATED 4.0 scale provides meaningful self-reported multidimensional sleep health data that aligns with objective behavioral measures of sleep. Future analyses will compare individual Ru-SATED dimensions with corresponding objective sleep measures over time as well as measures of satisfaction and alertness to enhance our understanding of multidimensional sleep health across populations.

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0328

PANDORE: A COMPREHENSIVE PLATFORM FOR ADVANCED SLEEP ANALYSIS AND DATA MANAGEMENT IN HEALTHCARE AND RESEARCH

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Introduction: The field of sleep medicine is rapidly evolving, with new methodologies and technologies enhancing the accuracy and efficiency of sleep analysis. "Pandore," a novel sleep analysis platform, has been developed to address the growing need for sophisticated data integration and analysis in this domain.

Methods: Pandore is built upon open-source frameworks, ensuring adaptability and accessibility. It integrates various state-of-the-art algorithms for sleep analysis implemented in common sleep software such as Yasa, RSleep, and Luna, and is designed to support the automatic application of these algorithms. The platform also facilitates artificial intelligence training, leveraging its extensive database for machine learning purposes. The data integration pipeline includes rigorous data quality assessments, particularly focusing on polysomnography records. Additionally, Pandore addresses organizational and technical challenges, including updates and maintenance. A unique aspect of this platform is its role-based system, specifically the enhanced role of sleep technologists, allowing them to integrate new methods into their analyses continuously.

Results: The initial deployment of Pandore has successfully integrated a workflow that includes normalization and quantitative analysis of sleep data. To date, the platform houses a database of 1,360 polysomnographies, from which over 500 distinct features per record can be extracted. 24 algorithms (Machine learning or expert systems) from the litterature are automatically applied over the growing database. This rich feature set enables a comprehensive analysis of sleep patterns and disorders.

Conclusion: Pandore development reflects the critical necessity of open-source software in the field of sleep medicine. The platform's design not only serves as a bridge between IT, data science, and sleep medicine but also ensures compliance with legal and regulatory constraints in healthcare data management. The successful deployment of its first version demonstrates its potential as a hub for various research projects or clinical applications and its capability in managing heterogeneous sleep data.

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0329

CLEARED FOR TAKEOFF: SLEEP LEADERSHIP TRAINING FOR AIR TRAFFIC CONTROL INSTRUCTORS

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Introduction: Chronic sleep insufficiency is a serious threat to military readiness in the United States. Many military members develop poor sleep habits early in their career. Career fields such as Air Traffic Control (ATC) are at greater risk for sleep and performance concerns. Sleep health is determined by individual, social, and systemic factors. Thus, a multilevel approach is warranted, including leveraging leaders' influence to promote sleep health within high-risk communities. The present study examined baseline sleep and sleep leadership behaviors among Air Force ATC training leaders. Sleep leadership is defined as awareness about benefits of good sleep health and promotion of helpful sleep habits among peers/subordinates.
Methods: Participants were 44 ATC instructors and military training leaders who completed an anonymous pre-training survey and then received an hour-long sleep leadership intervention. The baseline survey included the Split Week Self-Assessment of Sleep Survey as well as the Sleep Leadership Questionnaire, a self-report instrument measuring how often leaders engage in behaviors to promote healthy sleep among students. Participants then rated satisfaction and relevancy of the training and provided qualitative feedback on action steps they were considering
Results: Summary statistics indicated that leaders' total sleep time (TST), on average, was 6.04 hours (SD=1.63, IQR=1.87) on weekdays and 7.06 hours (SD=2.44, IQR=2.81) on weekends. Ninety-one percent reported they regularly (i.e., "sometimes"/"often"/"always") instruct students to get adequate sleep, but only 55% reported they inform Airmen about healthy sleeping habits (Fisher's exact p=0.036) Leaders agreed the training was interesting (endorsed by 77%) and relevant (endorsed by 68%), and 64% reported the training would help them as a leader. Qualitative data showed that many leaders identified specific action steps they planned to implement with ATC students.
Conclusion: Results suggested leaders tell students to prioritize sleep, but rarely provide specific behavioral tips for improving sleep or model optimal sleep behavior. Leaders noted the training was relevant to their role and identified concrete steps to promote sleep among their students. ATC leaders are highly respected by their students, and targeting sleep leadership appears to be a feasible and acceptable solution within a multi-level approach for improving sleep among high-risk military career fields
Support (if any):

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0330

CAFFEINE CONSUMPTION ABOARD THE INTERNATIONAL SPACE STATION

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Introduction: Caffeine is the most widely used performance-enhancing drug on Earth and astronaut crews have access to liquid coffee. While caffeine is a potent countermeasure to improve alertness and performance, it can also interfere with sleep. This can lead to performance deficits on the following day, driving a cycle of caffeine use to counter the effects of caffeine-induced sleep disruption. Caffeine availability may be limited during future Artemis and/or Mars missions. Therefore, we aimed to characterize how caffeine is used aboard the International Space Station (ISS) to better inform future spaceflight operations.
Methods: Daily caffeine consumption was determined from food and beverage intake tracking for 25 astronauts (11F) on 6-month International Space Station (ISS) missions. Data were recorded using the ISS Food Intake Tracker iPad App or other detailed recording technique. On average, crew recorded dietary intake on 179.7±68.6 (mean±SD) days inflight.
Results: Astronauts consumed 97±92 mg caffeine per day. All astronauts (25/25) in this study consumed caffeine at some point during flight, though the frequency, amounts, and regularity differed across crewmembers. Approximately a quarter of crewmembers were regular caffeine consumers (6/25), i.e., they ingested at least 90 mg caffeine (equivalent to one cup of coffee) on 90% of inflight days.
Conclusion: Our findings demonstrate that caffeine is regularly consumed by astronauts, though consumption patterns vary across individuals. Future analyses will involve evaluating these data in light of sleep and performance outcomes. This information will provide us with an understanding of how caffeine is being used inflight to help guide future countermeasure development.
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0331

OPPORTUNITIES TO IMPROVE SLEEP AND CIRCADIAN HEALTH IN ACTIVE DUTY SERVICE MEMBERS

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Introduction: Insufficient sleep and circadian disruption have both psychological and physiological consequences that impact the health and safety of military service members, yet research shows only about one-third of service members meet recommended sleep duration guidelines. To address this issue, interventions must be developed that are tailored to meet the specific needs of this community. Although substantial research has identified the adverse impacts of poor sleep, limited research has examined the underlying contextual factors that contribute to it between service branches or in different operational settings. Thus, the objective of this qualitative study was to identify factors that impede sleep health among active duty Marines.
Methods: Four focus groups were conducted with 23 active duty Enlisted Marines (87% male; 13% female). The semi-structured focus group guide assessed factors that impact sleep in Marines. Interview transcripts were analyzed using applied thematic analysis by two independent coders.

Results: All focus group participants reported low satisfaction with their sleep quality or duration. The most commonly reported barriers to sleep were work schedules. Many participants reported regularly working long and/or varied hours as part of their standard schedule, and others described unpredictable schedules due to frequently being kept at work late to complete unfinished tasks or for punitive reasons. Participants also described how Marine Corps culture influenced their attitudes towards sleep and sleep-related behavior — even when acknowledging the adverse effects of insufficient sleep on performance and mental health, participants described forgoing it for the sake of the mission, e.g., "It's very important to keep in mind that mission accomplishment is more important than, like, a night of sleep."
Conclusion: Poor sleep and circadian health were viewed by study participants as inherent to military service. However, the most salient barriers reported by Marines are potentially modifiable through scheduling interventions and interventions designed to reduce sleep stigma and promote healthy sleep hygiene.
Support (if any):

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0332
DESCRIPTIVE STUDY OF SLEEP PATTERNS AND KNOWLEDGE AMONG DEPARTMENT OF JUVENILE SERVICES STAFF

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Introduction: While research exists on adolescent sleep health in the US juvenile justice system, little is known about the sleep health of the staff that care for them. Poor sleep health, which is associated with negative mental and physical outcomes, may impact the daily interactions between staff and detained youth. The current study explored sleep-wake patterns and sleep health knowledge of DJS staff in Maryland.
Methods: Department of Juvenile Services Staff (N=218) were invited to respond to a survey that queried staff on their knowledge of adolescent sleep needs, job role and schedule, and their own sleep-wake patterns. Descriptive analyses and multivariate analyses of variance (MANCOVA) were conducted to review the staff's sleep-wake patterns across the existing staff positions and schedules.
Results: Of the DJS staff, 51% served as residential advisors (RAs) who directly supervise youth. Just over half (55%) of staff worked in detention, with the remaining 45% in treatment facilities. Staff reported sleeping 7.24 hours (SD=4.10) on workdays and 8.59 hours (SD=2.69) on non-workdays. Working the night/rotating versus day shifts was significantly associated with reports of greater weekday versus weekend irregularity and oversleep (p=.005), as well as sleepiness during work hours (p's< .05). Regarding adolescent sleep health knowledge, slightly more than half of the staff (53.9%) were knowledgeable with differences by position type. Specifically, night/rotating RAs and dayshift non-RAs were more likely to agree that sleep disturbances are tied to increased delinquency (41%; 27%) and that adolescent need ranges from 8-10 hours a night (41%; 27%).
Conclusion: Findings demonstrate that DJS staff meet the recommended sleep duration guidelines, however, RA staff experience irregularities in sleep schedule timing and time in bed. The observed staff variability in sleep health knowledge may provide impetus for staff sleep educational programming for staff, especially those who hold non-RA positions. Overall, this study may inform future development and prioritization of sleep and circadian health supports and resources, with the goal of improving sleep conditions for both the detained youth and DJS staff. These sleep health alterations may even have downstream effects in terms of improving relationships between staff and detained youth.
Support (if any): N/A

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0333
SLEEP PATTERNS THROUGHOUT MOUNTAIN WARFARE TRAINING IN U.S. MARINES MEASURED USING A CONSUMER WEARABLE

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Introduction: Poor acclimatization, high training demands, and sleeping conditions in the field can compromise the sleep of military personnel completing mountain warfare training. As chronic poor sleep can impact performance and recovery, individual differences in sleep may relate to differences in resilience during prolonged training. We characterized sleep patterns of Marines completing a mountain warfare training exercise (MTX) using a consumer wearable and explored relationships between sleep patterns and stress during training.
Methods: Marines (n = 59, aged 22±4 years [mean ± SD]) wore a consumer wearable (Oura Ring, Gen 2) during a 4-week MTX conducted in the fall (n = 17) or winter (n = 42). Participants also completed the Patient-Reported Outcomes Measurement Information System Sleep Disturbance scale (PROMIS; short form version 8b) and Stress Impact Scale (SIS) at three time points during each MTX (start, mid, end). Wearable-derived sleep outcome measures were averaged for each training phase and included total sleep time (TST), standard deviation of sleep midpoint, and wake after sleep onset (WASO). Longitudinal k-means clustering was used to identify different sleep patterns. Cluster by training phase (3×3) ANOVA were performed to explore relationships between sleep patterns and stress.
Results: Three clusters were identified. Cluster A (n = 31; 8 fall, 23 winter) had longer TST (6.8±0.7h) and low WASO (1.2±0.4h) but high PROMIS (high sleep disturbance; 56.2±5.2). Cluster B (n = 16; 6 fall, 10 winter) had short sleep (6.3±1.0h) but low WASO (1.4±0.5h) and low PROMIS (43.4±6.2). Cluster C (n = 12; 3 fall, 9 winter) had short sleep (5.9±0.8h), high WASO (1.9±0.5h), and high PROMIS (59.7±6.6). There was a significant effect of cluster on SIS ($p < .001$); cluster B (low sleep disruption group) reported higher scores (better stress management) than clusters A and C.
Conclusion: Three distinct sleep patterns were identified that varied in sleep duration with self-reported (PROMIS) and wearable-derived sleep disturbance metrics (WASO). Importantly, the low sleep disturbance cluster (Cluster B) reported managing stress better throughout MTX. Personnel with less disturbed sleep may cope better with prolonged training.
Support (if any): Office of Naval Research (work unit no. 62417).

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0334

OBSERVED CHANGES IN SLEEP DURATION AND SLEEP STAGE DISTRIBUTION DURING PREGNANCY USING WEARABLES

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[1] Google

Introduction: Prior studies on the evolution of sleep during pregnancy have either relied on a limited number of observed nights in a sleep laboratory or self-reported sleep values. Consumer wearable devices offer the capability of tracking sleep longitudinally in a large cohort of users, and revealing patterns of interest.
Methods: Users of commercially available wearable devices (heart rate enabled Fitbit devices) were offered to participate in a retrospective study about pregnancy and postpartum. 11470 currently pregnant users, and 13457 new parents (child< 1 year) were consented into the study. By applying strict criteria on wear usage per day (>80%) and throughout pregnancy (>80%), a set of 2540 participants was available for analysis. We considered changes in estimated sleep duration, and the distribution of sleep stages.
Results: Overall time-in-bed (TIB) increased at week 4 of pregnancy and reached a peak around Week 8 with an average increase of 26.7±42.6 minutes. TIB duration then declined at a rate of -1.28 min/week (95% CI:-1.35,-1.22 min/week) towards pre-pregnancy baseline value (~Week 30) and reduced further as the delivery date approached. Total Sleep Time increased from an average of 425.3±43.5 mins to a peak of 447.6±47.6 mins at Week 9 before beginning to decline throughout the rest of pregnancy. The initial increase in sleep duration was mostly due to an increase in light sleep. Deep sleep decreased significantly through pregnancy with an average overall loss of -19.2±13.8 mins by the end of pregnancy. REM sleep also decreased in later pregnancy by -9.0±19.2 mins from baseline. Sleep efficiency declined slightly during pregnancy (median sleep efficiency went from 88.3% to 86.8%).
Conclusion: Consistent with self-report sleep duration and smaller scale laboratory studies, we demonstrated that sleep duration and time-in-bed increases during the first trimester of pregnancy, but then decreases in both quantity and quality as pregnancy progresses.
Support (if any): This research was funded by Google Inc.

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0335

EVALUATING THE ROLE OF CIRCADIAN RHYTHM DYSREGULATION IN ALCOHOL USE DISORDER (AUD) RELAPSE PROBABILITY

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Introduction: Identifying factors predictive of relapse in patients with alcohol use disorder (AUD) is essential to learning how to effectively treat this disorder. Our group previously found that following inpatient treatment, AUD patients with lower sleep regularity were more likely to relapse. The aim of this study is to discern whether circadian rhythm dysregulation is predictive of relapse.
Methods: A cohort of patients who received inpatient treatment for AUD (n=126) wore Philip Respironics actiwatches following discharge for four weeks. A subset of patients additionally wore the watches during prior discharge from inpatient treatment (n=24). Relapse status was assigned if a patient consumed any alcohol during the outpatient period of data collection. We calculated circadian rhythm nonparametric statistics including interdaily stability (IS) and intradaily variability (IV) for the inpatient and outpatient periods. Linear and logistic generalized mixed models were fit in R to estimate the effect of the inpatient-outpatient transition on circadian behavior, and of weekly circadian parameters on relapse probability. All analyses account for within-patient repeated measurements.
Results: Final sample size included 103 patients after actigraphy data filters were applied. Patients were 48.6±11.3 years of age and 32% female. Among patients with at least 4 days of inpatient data, IV was on average 0.068 units lower during the first week post-discharge (SE=0.018, F[1,29]=14.92, p< 0.001). By contrast, IS did not substantially change following discharge. Twenty-six patients (25.2%) experienced a relapse event. Relapse at any time during the study was associated with a mean 0.03 unit decrease in IS (SE=0.014, F[1,101]=4.29, p< 0.05), whereas relapse was not associated with a significant shift in IV.
Conclusion: Our preliminary analyses detected a change in circadian behavior (IV) at discharge, which may be an effect of scheduled activities that cease upon discharge. General alignment to a 24-h cycle, as captured by IS, was not disrupted by discharge. However, IS but not IV exhibited an association with relapse. Additional research on this topic will include clinical patient covariates and time to determine if IV and/or IS are predictive of later relapse and time until relapse.
Support (if any): This research was supported by the National Institutes of Health Intramural Research Program.

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0336

WORKDAY RHYTHMS AND BEDTIME BEHAVIORS: THE ROLE OF WORK TIMING AND DURATION IN BEDTIME PROCRASTINATION

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Introduction: Bedtime procrastination, or bedtime delays in the absence of external obligations, is a common behavior that undermines multiple dimensions of sleep health. Most research investigating the factors which underly bedtime procrastination centers on cognitive processes (i.e., self-regulation, rumination, worry). However, individuals may also intentionally delay their bedtime to provide themselves with personal time to wind down at the end of a late work day. The current study sought to evaluate whether work timing, duration, and time spent winding down at the end of the day were associated with bedtime procrastination in a daily diary investigation of young adults' sleep behaviors.
Methods: 117 young adult participants (Mage = 25.2, SD = 8.3) completed 14-days of experience sampling assessment, including self-report measures of daily work schedules and morning ratings of prior-night bedtime procrastination and wind down time. Participants also completed the morningness-eveningness questionnaire as a measure of chronotype. Multilevel models were constructed to identify the contributions of work timing (start and end time), work duration, and end-of-day wind down duration in daily bedtime procrastination.

Results: Across days, average later work start time (B = 0.50, p = 0.017) and end time (B = 0.39, p = 0.043) were associated with higher average bedtime procrastination. However, there were no significant associations observed at the level of daily observations. Work duration and self-reported wind down duration at night were not associated with either average or daily bedtime procrastination. Secondary analyses revealed that, when chronotype was included in the model, the association between work timing and bedtime procrastination was reduced to non-significance.
Conclusion: Individuals who had later average work timing were more likely to habitually procrastinate their bedtime. However, the within-person association was not significant; daily changes in work schedule were not associated with same-day variation in bedtime procrastination, indicating that this may not be a mechanism for sleep delay behavior. Further, findings suggest that shared variance with evening chronotype may partially explain the observed association between work timing and bedtime procrastination. Future research should distinguish between preferences for doing activities in the evening and circadian timing in the development of bedtime procrastination.
Support (if any):

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0337
IMPACT OF SLEEP SCHEDULE CHANGES ON THE INTERNATIONAL SPACE STATION

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Introduction: Astronaut crews have historically averaged six hours of sleep per night. In recent years, ISS crew have had more stable schedules, with consistent bed and wake times. Despite these improvements, there remain uncontrollable operational events that require crewmembers to shift their sleep. It is unclear what impact these acute schedule changes have on sleep and performance outcomes. The aims of this analysis are to characterize approaches to sleep shifting and to determine the impact on sleep outcomes and crew alertness and performance.
Methods: Crewmembers (n = 20) on the ISS were provided with actiwatches that they wore before flight, inflight, and immediately upon return. They were scheduled for 8.5 hours of sleep per day, between 2130-0600, unless operational events took place during the sleep episode. We characterized the impact of two types of sleep shifts, including splitting the daily sleep opportunity in two ("split sleep") and shifting the entire sleep opportunity later, following the operational event.
Results: Ten crewmembers had 15 episodes of split sleep while inflight. These periods surrounded seven separate operational events that interfered with their nominal sleep window. The first sleep opportunity typically occurred before the disrupting event, while the second took place the following morning. Sleep duration was shorter (M1=2.60(0.80) vs. M2=4.11(1.51)) and efficiency lower (M1=74.72(13.94) vs. M2=82.50(8.99)) during the first sleep opportunity. When aggregating the two periods, the sleep opportunity lasted 7.08(1.06) hours. Thirteen individuals had 28 phase delayed sleep episodes following 11 disruptive events. These single sleep episodes were 5.99(1.05) hours long, sleep efficiency averaged 84.31(7.71), and the sleep opportunity was 6.85(0.67) hours. On remaining nights, crewmembers averaged 6.63(0.49) hours of sleep with a sleep efficiency of 82.51(3.41) and sleep opportunity of 7.45(0.51).
Conclusion: Scheduling astronauts for off-nominal operations came with some costs. When crew split their sleep, they slept longer than the average, while a delay reduced sleep. Crew had shorter sleep opportunities when forced to sleep outside of the nominal window, leading to improved sleep efficiencies. Further study is needed to determine the best scheduling approaches to accommodate uncontrollable operational events.
Support (if any):

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0338
CONSOLIDATED WORK SCHEDULE: THE IMPACT ON FIREFIGHTERS' SLEEP AND HEALTH

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Introduction: Career fire departments in the US typically operate on a variety of 24-hour shift schedules, the most common being 24-hours-on and 48-hours-off (24/48). Recently, more departments have expressed interest in consolidated work schedules, specifically the 48-hours-on and 96-hours-off (48/96), to attract new recruitments, reduce commute frequencies, and improve firefighter morale. While some firefighters may be able to rest when not otherwise responding to emergencies and other tasks, it is uncertain how consolidated work schedules impact sleep and health. Therefore, the objective of this research is to assess sleep and health outcomes before and after firefighters transitioned to a consolidated work schedule.
Methods: A Southcentral US fire department (n=24) participated in this longitudinal study. Baseline assessment was conducted while firefighters operated on the 24/48 and post assessment was conducted six months after transitioning to the 48/96. Total sleep time (TST) was assessed for 18-days each round using wrist actigraphy and the Emergency Services Sleep Diary. At the beginning of each round, participants completed a questionnaire that included the Insomnia Severity Index (ISI), Beck Depression Inventory II (BDI-II), Beck Anxiety Invitatory (BAI), and Multidimensional Assessment of Fatigue (MAF).
Results: The results of paired t-tests indicated statistically significance difference means for ISI scores [$t(23) = 2.83, p < 0.01$] and BDI-II scores [$t(23) = 4.49, p < 0.001$], suggesting insomnia and depression scores improved during the 48/96. Mean ISI scores before and after shift schedule transition are 7.4(4.2) and 5.5(3.5), respectively. The mean BDI-II scores before and after are 5.3(4.8) and 3.3(4.4). No statistically significant differences were found in TST, BAI, and MAF scores.
Conclusion: Firefighters reported an improvement in insomnia and depression six months after transitioning to the 48/96 consolidated work schedule. Since sleep, anxiety, and fatigue were not statistically different, the results suggest that the 48/96 may provide firefighters an opportunity to develop a more consistent sleep pattern due to fewer early awakenings to commute to work. However, further research is needed to continue assessing these relationships along with exploring how differences in workload (e.g., emergency calls) may influence these outcomes.
Support (if any): The development of the research reported herein was supported by FEMA Fire Prevention & Safety Grant, EMW-2022-FP-00464.

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0339

THE PERCEPTION OF THE NEGATIVE IMPACT OF WORKLOAD AND STUDY LOAD IN CANADIAN UNIVERSITY STUDENTS

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Introduction: Studies showed that university students are at risk of presenting sleep difficulties. Various factors, including academic workload, and employment status can significantly impact their sleep. The present study aimed to investigate specific factors affecting sleep quality in Canadian university students.
Methods: A total of 1169 Canadian university students completed an online survey. Information about classes, hours devoted to study and work, and the negative impact of their studies and paid work on their sleep was gathered. A multiple regression and a simple linear regression analyses were done to verify the contribution of 1) study load and 2) workload (job) on the perception of a negative impact on sleep.
Results: In total, 64.8% of students were enrolled in at least 4 classes. They spent an average of 23.9 hours per week on their studies. A total of 47.3% reported a negative impact of 7 and more out of 10 (10 being the worst) of their studies on sleep. Analyses on study load show a significant model ($F(2, 865)=33.13$, $p< 0.001$) that explained 7% of the variance in the perception of a negative impact of studies on sleep. Results show that being enrolled in more classes ($b=.29$, $t(865)=4.92$, $p<.001$) and devoting more time to their studies ($b=.03$, $t(865)=5.42$, $p<.001$) significantly predict perception of a higher negative impact of studies on sleep. In total, 65.6% of students reported having a job, working an average of 20.1 hours per week. Results show that 56.1% reported a negative impact of 7 or more of their job on sleep. Analyses on workload show a significant model ($F(1, 578)=109.91$, $p<.001$) that explained 16% of the variance in the perception of a negative impact of their job on sleep. Results suggest that a higher number of hours worked ($b=.10$, $t(578)=10.48$, $p<.001$) significantly predict perception of a higher negative impact on sleep.
Conclusion: These results raise important issues regarding the study-work-sleep balance of Canadian university students. Many of them have a heavy study load, while many also have a job. Given the importance of sleep for mental health and cognitive performance, these results are of great concern.
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0340

THE INFLUENCE OF NEED SATISFACTION ON CHANGES IN COLLEGE STUDENTS' SLEEP PROBLEMS

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Introduction: Self Determination Theory (SDT) provides a framework for understanding human motivation by articulating three fundamental needs (i.e., autonomy, belongingness, and competence) that drive/direct behavior and are necessary for our basic functioning and well-being (Deci & Ryan, 1985, 2000). Despite extensive research demonstrating how SDT operates within our daily lives, the association between college students' sleep and these motivational processes remains relatively opaque. Sleep is critical to college students' functioning and well-being (Lund et al., 2010), but the few studies linking need satisfaction to sleep and other aspects of functioning have neglected to examine change over time amongst these constructs (Campbell et al., 2015; Campbell et al., 2017). Accordingly, research examining prospective associations between need satisfaction, sleep-related behaviors, and changes in students' sleep is needed.
Methods: Based on a 2-wave design (baseline and 2-month follow-up), the current study included a sample of 331 participants (86% female) who were assessed through an online survey. The sample's mean age was 21.3 years (SD=2.4; range 18-34), and 65.9% of participants identified as white, with 18.4% Asian or Pacific Islander, 6.6% Latinx, and 5.7% Black and 3.3% multiracial or "other." Students' mean family income was $108,391 (SD=$62,579), with approximately 22% of students reporting family incomes of $50,000 or less and 16.3% with family incomes greater than $200,000.
Results: Controlling for participants' gender, family socioeconomic status, sleep environment, and sleep hygiene behaviors, regression analyses examined the predictive value of need satisfaction (i.e., autonomy, belongingness, and competency) on residual changes in students' sleep problems across a 2-month period. After controlling for our covariates, baseline sleep problems ($\beta = .54$, $p < .001$), sleep-related competency ($\beta = -.13$, $p < .01$), and interpersonal need strain (i.e., lack of belongingness; $\beta = .17$, $p < .001$) predicted residual increases in students' sleep problems.
Conclusion: Results from the current study suggest that both sleep-related competency and interpersonal needs/belongingness play a key role in changes to college students' sleep problems. These novel findings highlight the importance of basic need satisfaction in sleep and provide additional evidence for how SDT might be incorporated into sleep research.
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0341

NAVIGATING SLEEP: PERCEPTIONS OF GRADUATE HEALTH PROFESSIONS STUDENTS

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Introduction: Sleep health is a term used to describe the characteristics of individuals that influence how much sleep they get and how well they sleep throughout the night. Postsecondary students are at a greater risk of poor sleep health due to the demands and changes in college. The purpose of this basic interpretative qualitative study was to understand how being a graduate health profession student influenced sleep practices and habits in Doctor of Physical Therapy (DPT) and Occupational Therapy Doctorate (OTD) students: DPT and OTD students enrolled in traditional (face-to-face) programs were recruited for this study.
Methods: Using the purposeful sampling approach, the researcher recruited eleven participants who met the study's inclusion criteria. Participants were interviewed about their sleep experiences in a private setting through Zoom. Data analysis was performed through a review of the transcripts. Identifying themes explained participants' experiences, and interpretations were shared with participants as part of the analysis process

Results: Four themes emerged: factors influencing sleep health, consequences of poor sleep, sleep education, and proposed student support.
Conclusion: The sleep experiences of DPT and OTD students identified the need for sleep education and prioritization in graduate health science programs. Knowledge about sleep, specifically sleep hygiene, could assist graduate health science students in their role as clinicians.
Support (if any):

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0342

EATING HABITS, DEPRESSION, AND POOR SLEEP: ASSESSING THE ASSOCIATIONS IN FIRST-YEAR COLLEGE STUDENTS

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Introduction: Transitioning from high school to college often poses significant challenges to students. In many cases, freshmen are now required for the first time to take care of their health habits, including making choices surrounding food and sleep. Diets higher in fats and lower in fruits and vegetables have frequently been associated with an increase in inflammatory biomarkers, which may lead to increased symptoms of depression and poorer sleep (Firth et al., 2019; Hagedorn et al., 2021).
Methods: Given the increased rate of depression (Liu et al., 2022) and sleep disturbance (Luo & Hu, 2022), we conducted a simple mediation analysis using PROCESS macro, Model 4, on first-year college students (N = 73), to assess whether eating habits predicted sleep quality directly, and indirectly via depressive symptoms. We hypothesized that eating habits would directly and indirectly predict sleep quality.
Results: Results indicated that there was no direct relationship between eating habits on sleep quality. However, we found that there was an indirect relationship between eating habits on sleep quality via depression.
Conclusion: Thus, our findings highlight the importance of having a well-balanced diet for different health outcomes. Given that depression and poor sleep are associated with poor school performance due to memory and concentration issues (Dillon & Pizzagalli, 2018; Hershner & Chervin, 2014), promoting healthy food choices for students is necessary to allow for success in college.
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0343

SLEEP KNOWLEDGE, INFORMATION, AND VALUES TEST: A NEW MEASURE TO EXAMINE COLLEGE STUDENTS

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Introduction: College students are notorious for inconsistent sleep schedules and poor sleep hygiene, which can influence mental health and academic success. Many intervention programs seek to improve college student sleep quality by educating them on the importance of sleep and healthy sleep behaviors; however, it remains an open question whether poor sleep behaviors are due to a lack of knowledge about sleep. To inform this issue, we developed a test of sleep knowledge and compared outcomes to standard scales of sleep duration and quality.
Methods: Participants (N=130, 21 male) included full-time undergraduate students (mean age=19.65, SD=1.54 years) who completed a series of online questionnaires examining sleep quality and duration (Pittsburgh Sleep Quality Index, PSQI), sleep hygiene (Sleep Hygiene Index, SHI), and a new measure of sleep knowledge (Sleep Knowledge, Information, and Values Test, SKIV). The SKIV is a self-reported questionnaire that includes questions about weekday and weekend sleep duration, sleep quality, confidence and source of sleep health knowledge, perceived importance of sleep education in different populations, and basic sleep hygiene and sleep health questions.
Results: Average sleep duration (PSQI) was 7.00 hours per night (SD=1.36) and sleep quality was poor (PSQI M=6.86, SD=3.33). Participants scored an average 13.47 out of 20 points (SD=3.59) on multiple choice and multi-answer questions about general sleep knowledge (SKIV). SKIV sleep knowledge test scores and SKIV ratings of importance of sleep education were positively correlated with SHI scores (M=21.53, SD=7.56; r=.309, p<.001 and r=.267, p=.002), but not PSQI global sleep quality (r=-.025, p=.783; r=.005, p=.954) or PSQI sleep duration (r=.065, p=.463; r=.071, p=.423). SHI scores were significantly correlated with PSQI sleep quality (r=.467, p<.001).
Conclusion: College students with greater sleep knowledge reported engaging in better sleep hygiene practices, but still showed short duration or poor quality sleep. Therefore, future interventions should go beyond sleep education to changing environmental features (e.g., noise and light in dormitories) and institutional practices (early class start times, midnight homework deadlines) that hinder sleep health in students.
Support (if any): None.

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0344

CONVERGENT AND DIVERGENT VALIDITY OF A SLEEP HEALTH LITERACY MEASURE

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Introduction: The Sleep Health Literacy (SHL) scale, grounded in the integrated model of health literacy, consists of two subscales: "Sleep Health Communication" and "Sleep Health Knowledge." This study aims to explore the validity of the SHL scale by examining its relationships with scales measuring health literacy, sleep, and non-related constructs. Further, this study sought to conduct confirmatory factor analysis to evaluate the reliability of the SHL measure.
Methods: 253 students were recruited from the undergraduate SONA psychology pool (M age = 20.3, 53% white, 75% women). Participants completed the Dysfunctional Beliefs about Sleep Scale, Sleep Practices and Attitudes Questionnaire (SPAQ), Sleep Beliefs Scale (SBS), Sleep Hygiene Index (SHI), Insomnia Severity Index (ISI), All Aspects of Health Literacy Scale (AAHL), Alcohol Use Disorder Identification Test (AUDIT), and General Anxiety Disorder 7 Item (GAD-7) Scale as well as the Sleep Health Literacy (SHL) Scale.
Results: The SHL part 1 was significantly associated with part 2 scores (r = .25, p < .00), the sleep hygiene index (r = .21, p < .002), sleep beliefs scale total correct (r = .28, p

< .00), AAHL total score (r = -.27, p < .00), AAHL communicative subscale (r = -.39, p < .00), functional (r = .15, p = .04) and AAHL critical subscale (r = -.25, p < .00). Scores on part 2 of the SHL were correlated with items correct on the SBS (r = .53, p < .00) and AAHL functional subscale (r = .15, p = .04). Confirmatory factor analysis (CFA) was performed on two factors and showed a model with reasonable fit (χ^2 = 144.986, df = 43, p < 0.001, RMSEA = 0.103, CFI = 0.833, GFI = 0.891, AGFI = 0.832).

Conclusion: This study examined the Sleep Health Literacy (SHL) Scale, a tool designed to assess an individual's ability to communicate and comprehend sleep-related concepts. The scale demonstrated significant associations with related constructs, including sleep hygiene, sleep beliefs, and health literacy. These findings contribute to the SHL scale's potential for assessing sleep health literacy and offer useful insights into areas of refinement.

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0345

THE MODERATING EFFECT OF SCREEN TIME ON THE RELATIONSHIP BETWEEN PHYSICAL ACTIVITY AND SLEEP IN YOUNG ATHLETES

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Introduction: Studies have emphasized the significance of sleep in performance and well-being of young athletes. Physical activity has been shown to improve various aspects of sleep in adolescents, including sleep quality. Yet, excessive screen time has been found to have a negative impact on sleep among adolescents, possibly dampening the beneficial effects of physical activity. Hence, our research aimed to investigate the moderating effect of screen time on the relationship between physical activity and sleep quality in young athletes.

Methods: 211 young elite athletes (M=14.9±1.6 years old; 60.4% females) completed online questionnaires, including the Pittsburgh Sleep Quality Index (PSQI) and a homemade sports and lifestyle habits questionnaire. A moderation analysis was conducted using PROCESS 4.2 to examine the moderating effect of screen time (the average number of hours per day spent on screens) on the relationship between physical activity (the average number of training hours per week) and sleep quality (subscale #1 of the PSQI). Age, BMI, and sex were added as covariates, since they were correlated with the physical activity and sleep quality variables.

Results: The moderation model was significant (F(6,203)=8.14, p<.001) and accounted for 16.2% of the variance. Results indicate a significant main effect of screen time on sleep quality (b=.294, p=.004) and a significant interaction of screen time and physical activity on sleep quality (b=.005, p=.021). Physical activity was associated with sleep quality when screen time was at one SD below the mean (b=-.025, p<.018) but not at the mean (b=-.006, p<.433) nor above the mean (b=.014, p<.236). The simple plot analysis revealed that when young athletes had low screen time, more physical activity was related to better sleep quality, while lower training hours were associated with poorer sleep quality. However, in athletes with high and average screen time, their level of physical activity was not related to their sleep quality.

Conclusion: This study highlights the possible mitigating effect of screen time on the potential beneficial association between physical activity and sleep in young athletes. This underscores the importance of promoting healthy lifestyle habits and appropriate sleep hygiene among athletes, who are also a population at greater risk of sleep disturbances.

Support (if any):

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0346

INSOMNIA IN THE INITIAL MONTHS OF EMERGENCY WORK IS ASSOCIATED WITH FUTURE PTSD SYMPTOMS IN NEW RECRUIT PARAMEDICS

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Introduction: New paramedics commencing emergency work and adjusting to shift work can experience an increase in sleep problems. Sleep disturbances have been closely associated with poor mental health in emergency personnel. It is unknown, however, whether poor sleep experienced in the initial months of emergency work represents an early risk factor for future mental health problems in paramedics. The present study examined whether sleep disturbances in paramedics after 6-months of shift and emergency work were associated with mental health symptoms later in their career.

Methods: Sleep disorder and mental health symptoms were examined in new recruit paramedics (n=105) after their first 6- and 12-months of shift and emergency work. At each timepoint, participants completed validated self-report measures of insomnia (Insomnia Severity Index), shift work disorder (SWD; SWD Screening Questionnaire), obstructive sleep apnoea (OSA; Berlin Questionnaire), depression (Patient Health Questionnaire-9), anxiety (Generalised Anxiety Disorder-7), post-traumatic stress disorder (PTSD; PTSD Checklist-5) and trauma exposure (Life Events Checklist-5). Linear regressions examined whether sleep at 6-months (i.e., insomnia, SWD, and OSA) predicted mental health symptoms (i.e., depression, anxiety, and PTSD) at the 12-month follow-up, while controlling for demographics (i.e., age and sex) and mental health symptoms at the 6-month timepoint. Additionally, the regression models examining sleep and PTSD also controlled for trauma exposure at 6-months via the Life Events Checklist-5.

Results: Increased insomnia symptoms at 6-months of emergency work and shift work significantly predicted higher PTSD symptoms at the 12-month timepoint (b=0.09 [0.03,0.15], p=0.01) while controlling for trauma exposure, PTSD symptoms and demographics at 6-months. Insomnia at 6-months was not, however, related to depression (p=0.36) or anxiety (p=0.42) at follow-up, and OSA and SWD risk at 6-months were not related to any of the mental health outcomes at follow-up (all p>0.05).

Conclusion: Our findings highlight insomnia symptoms in the initial months of emergency work as an early risk factor for the development of PTSD later in new paramedics' careers. Given sleep is a largely modifiable factor, this finding highlights the

need to investigate interventions that target insomnia early in paramedics' careers to reduce the risk of future mental health problems in this high-risk occupation.
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0347

SLEEP BEHAVIOUR AND SHIFT WORK TOLERANCE IN NEW PARAMEDICS BEGINNING SHIFT WORK

Rachael Harris[1], Sean P.A. Drummond[1], Ben Meadley[2], Shantha M.W. Rajaratnam[1], Brett Williams[2], Karen Smith[3], Kelly-Ann Bowles[2], Elle Nguyen[3], Megan L. Dobbie[4], Alexander P. Wolkow[3]

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Introduction: In experienced shift workers, researchers have evaluated levels of shift work tolerance (SWT) and sleep behaviours. SWT refers to not experiencing negative consequences associated with shift work, whereas sleep behaviours, describe strategies workers may use to cope with shift work. Neither sleep behaviours nor SWT have been longitudinally investigated in new emergency personnel. The current study aimed to track changes in sleep behaviour during the first 12-months of shift work, and secondly to explore whether changes in sleep behaviour were associated with SWT after 12-months of work.
Methods: One-hundred and five recruit paramedics were investigated at baseline (before shift work), and after 6- and 12-months of shift work. Paramedics' sleep and mental health were evaluated at each timepoint via questionnaires. Participants also completed a 14-day shift work (via work diaries) and sleep (via sleep diaries and actigraphy) monitoring period at each timepoint. Sleep opportunity (SO), regularity, and behaviours in relation to nightshift were investigated. SWT at 12-months was categorised based on symptoms of depression, anxiety, insomnia, and sleep quality and efficiency on rest days.
Results: Linear mixed models found SO increased on day shifts and rest days, and sleep regularity declined from baseline to 6- and 12-months of shift work. There were no changes in SO on rest days, day shifts, or nightshifts between 6- and 12-months of shift work. Latent profile analyses identified levels of SWT as high (n=52), medium (n=27), and low (n=9) after 12-months of shift work. These profiles were primarily distinguished by levels of insomnia, depression, and anxiety. Increasingly irregular sleep between 6- and 12-months of shift work, and prioritising major sleep episodes (i.e., ≥3hrs) rather than naps at 6-months predicted classification as high SWT.
Conclusion: Our findings suggest after 12-months of shift work, different levels of SWT exist in paramedics, distinguished by their severity of insomnia, depression, and anxiety symptoms. Though sleep behaviours across the whole cohort did not change between 6- and 12-months, those whose sleep became less regular were more likely to have high SWT. Likewise, prioritising major sleep episodes at 6-months was associated with better SWT after 12-months of shift work.
Support (if any):

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0348

THE MEDIATING ROLE OF SLEEP DURATION IN THE LINK BETWEEN NIGHT SHIFT WORK AND INFLAMMATION IN NURSES

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Introduction: Identifying risk factors and mechanisms involved in heightened inflammation is critical for developing targeted interventions. Night shift work is a well-established factor contributing to disrupted and insufficient sleep, which is linked to heightened inflammation. This study aimed to assess the impact of night shift frequency and sleep duration on inflammatory biomarkers in a sample of nurses.
Methods: As part of a larger longitudinal study, 392 nurses (mean age = 39.54 years, 92% female; 23% night shift-working) completed daily sleep diaries and wore an actigraphy watch for 7 days. On day 7, nurses had blood drawn to measure inflammatory markers, including C-reactive protein (CRP), interleukin-6 (IL-6), tumor necrosis factor alpha (TNF-α), and interleukin-1 beta (IL-1β). Mediation analyses were conducted to examine the mediating role of sleep duration on the links between night shifts worked in the past 7 days and inflammatory markers on day 7.
Results: Sleep duration did not mediate the effect of night shift work on inflammatory biomarkers. However, there were several significant direct effects. More night shifts worked was associated with lower actigraphy-measured sleep duration ($b = -0.16$, $p < 0.001$) and greater IL-6 ($b = 0.03$, $p = 0.002$). Similarly, more night shifts worked ($b = 0.03$, $p = 0.003$) and lower self-reported sleep time ($b = -0.19$, $p < 0.001$) were independently linked to greater IL-6. Fewer night shifts worked ($b = -0.05$, $p = 0.02$) and lower self-reported sleep duration ($b = -0.19$, $p < 0.001$) were associated with higher IL-1β.
Conclusion: Given the critical role that nurses play in the healthcare system, it is important to understand the potentially modifiable factors impacting their health and well-being. This study demonstrated that short sleep duration may explain how night shift work impacts physiological dysregulation in nurses, including elevated systemic inflammation. Promoting adequate sleep opportunity in shift workers may be a way to improve their long-term health outcomes, although additional future experimental work on this topic is needed.
Support (if any): NIAID 1R01AI128359 (PIs: Taylor & Kelly)

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0349

DIFFERENCES IN SLEEP ON WORKING AND OFF DAYS IN SHIFT WORKING NURSES

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Introduction: Sleep deficiencies are common in nurses, with up to 89% of nurses working some form of shiftwork (i.e., working before 6am and/or after 9pm). It is estimated that approximately 34% of nurses report insomnia disorder and 14% report shift

work sleep disorder. Nurses face unique physical, psychological, and occupational demands that disrupt their sleep quality and duration and may conflict with their natural circadian rhythm.
Methods: Nurses (N = 26, 88% female, 80% white, mean age = 36.16 years, SD = 8.56) were asked to wear an Actiwatch to measure objective sleep parameters, a daily adhesive sweat collection patch, provide two blood samples (at Day 1 and Day 7), and report daily subjective sleep parameters (total sleep time, sleep onset latency, wake after sleep onset, and sleep efficiency) via the Consensus Sleep Diary for 7 days. The sample was further divided into day shift (n = 14) and night shift (n = 12) nurses. Data collection and cleaning are ongoing and preliminary results of complete sleep diary data are presented.
Results: Results of the independent sample t tests suggest that total sleep time was significantly different on days on shift versus off shift ($t(86) = 2.94$, $p = .002$) for day shift nurses but not for night shift nurses ($t(76) = .48$, $p = .317$). There was no difference in total sleep time between day and night shift workers. Additional exploratory analyses will be completed by the conference, comparing additional parameters (e.g., timing) in individual sleep periods (i.e., 1st work day, 2nd work day; 1st off day, 2nd off day) both within (night & day shift), as well as between (night vs day shift) groups on the final sample (N=40; 20 day and 20 night shift).
Conclusion: The results may indicate that day shift nurses have more variable sleep than night shift nurses. Further analyses will help fill gaps in our understanding of the deficient (i.e., inadequate, interrupted, mistimed) sleep in nurses (i.e., within and between day and night working), as well as inform potential interventions (i.e., CBTI for shift workers) to improve the sleep of critical nursing staff.
Support (if any):

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0350

PATHWAYS: EXPLORING THE RELATIONSHIP BETWEEN SHIFT WORK AND THE GUT MICROBIOME

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Introduction: Shift work is associated with sleep and circadian disruption, which may have adverse effects on the gut microbiome. However, little is known about the relationship between shift work and the gut microbiome in free-living humans. In this study, we aimed to investigate whether shift work detrimentally impacts the gut microbiome.
Methods: Day- and night-shift workers were recruited from clinical settings. Mann-Whitney tests were used to compare alpha-diversity (Inverse Simpson), beta-diversity (Bray-Curtis dissimilarity), and taxa relative abundance between groups. Percent differences are reported for taxa that differed based on Mann-Whitney tests ($P< 0.05$). Because these analyses are preliminary, unadjusted p-values are presented.
Results: Six night- (83% female, age 29 ± 2.5) and six day-shift (50% female, age 33 ± 6.8) workers were included. Mean alpha-diversity was 9.0 among day-shift workers and 8.1 among night-shift workers ($P=0.64$). Shift work explained 8.5% and 9.7% of variability in genera and species beta-diversity, respectively ($P=0.50$, 0.38). Night-shift workers had 102% higher mean relative abundance of Intestinimonas ($P=0.04$), while day-shift workers had 99% higher relative abundance of Mogibacterium ($P=0.01$). Day-shift workers had 79% higher mean relative abundance of Mogibacterium diversum ($P=0.02$), while night-shift workers had 87% higher relative abundance of Streptococcus suis ($P=0.04$) and 108% higher relative abundance of Treponema succinifaciens ($P=0.02$).
Conclusion: This study provides preliminary evidence that shift work may be associated with alterations to the gut microbiome. For example, we observed differences in the abundance of Intestinimonas and Mogibacterium. Intestinimonas is a butyrate-producing microbe, with anti-inflammatory effects, while Mogibacterium is thought to be deleterious to gut health. These associations are in the opposite direction than we expected, perhaps because participants were from a healthy population and this is a compensatory mechanism, though further exploration is needed. Future analyses will examine the functional potential of the gut microbiota in day- vs. night-shift workers.
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0351

PROTECTIVE FACTORS BUFFER THE IMPACT OF HIGH SHIFT WORK DISORDER RISK ON HEALTH OUTCOMES

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Introduction: Shift work disorder (SWD) is a circadian rhythm sleep disorder associated with increased chance of experiencing poor mental health symptoms and physical health complaints. Traditional protective factors, such as resilience, as well as the ability to sleep at different times of the day, known as sleep flexibility, are known to reduce the risk of SWD, and to protect against poor mental health. However, more research is needed to understand how protective factors and SWD risk interact to predict health and wellbeing outcomes. The current study aimed to explore the role of traditional and sleep-specific protective factors in buffering the impact of high SWD risk on mental health and physical health complaints.
Methods: One hundred and twenty-six permanent nightshift workers or those working rotating shift schedules including nightshifts participated in an online cross-sectional study. The SWD-screening questionnaire determined participants' SWD risk (low vs high). Participants completed validated measures to assess depression (Patient Health Questionnaire), anxiety (Generalized Anxiety Disorder Questionnaire), insomnia (Insomnia Severity Index), excessive sleepiness (Excessive Sleepiness Scale), sleep quality (Pittsburgh Sleep Quality Index), and physical health complaints (Subjective Health Complaints inventory). Participants also completed measures assessing protective factors, including resilience (Resilience Scale), social support (Social Provisions Scale), organisational support (Survey of Perceived Organizational Support), perseverance (Short

Impulsive Behaviour Scale), morningness-eveningness (reduced Morningness-Eveningness Questionnaire), and sleep flexibility and languidity (Circadian Type Inventory).
Results: Multiple regression analyses revealed that in individuals with high SWD risk, having high social support was associated with reduced depression symptoms (p=.004). In those at risk of SWD, higher levels of morningness protected against insomnia severity (p=.01) and poor sleep quality (p=.01). Lastly, high perceived organisational support buffered the impact of SWD risk on gastrointestinal (p=.006) and allergy complaints (p=.005).
Conclusion: Improving support systems for shift workers presents an opportunity to prevent poor outcomes when workers are experiencing SWD symptomology. For instance, organisations can implement strategies that support workers to reduce symptoms of depression and physical health complaints. Furthermore, organisations that rely on shift work should consider strategies to support those with low morningness, especially when they are at risk of SWD.
Support (if any):

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0352

ASSOCIATION BETWEEN SLEEP AND CARDIOVASCULAR DISEASE RISK FACTORS IN SEDENTARY DESK WORKERS

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Introduction: Cardiovascular disease (CVD) is a leading cause of death in US adults. Elevated blood pressure (BP) and arterial stiffness are risk factors for CVD in adults. Unhealthy sleep behaviors, irregular sleep patterns, and sleep disorders have been associated with an increased risk of developing CVD. We sought to examine the associations of device-assessed and self-reported measurements of sleep and BP with carotid-femoral pulse wave velocity (cfPWV) in adult desk workers with elevated BP.
Methods: Using baseline data from RESET BP trial, 175 desk workers with elevated BP were included in analyses (85.2% White; 58.3% female; age 45.5±10.8 y; body mass index [BMI]=31.1±6.7 kg/m2; resting systolic BP [SBP] 128±8 mmHg, resting diastolic BP [DBP] 83±7 mmHg). Participants wore an Actiwatch Spectrum accelerometer on their nondominant wrist for approximately 7 days, from which mean and standard deviation [SD] of sleep midpoint, mean daytime napping duration, mean wake after sleep onset (WASO), and mean sleep duration were obtained. The Pittsburgh Sleep Quality Index (PSQI), Insomnia Severity Index (ISI) and Epworth Sleepiness Scale (ESS) provided self-reported perceptions of sleep quality, insomnia severity, and sleepiness, respectively. Resting PWV was captured via tonometry from the right carotid and femoral arteries. Blood pressure was assessed using 24-hour ambulatory monitoring, with separation into daytime and nocturnal BP based upon diary entries. Multivariable regression models adjusting for gender, age, and BMI were fitted; p-values were adjusted for multiplicity with the Benjamini-Hochberg procedure.
Results: WASO was associated with greater nocturnal BP; for every 30 additional minutes of WASO, nocturnal SBP was 3.0 mmHg (SE=0.72, p=0.048) greater and DBP was 2.9 mmHg (SE=1.1, p=0.008) greater. Poor sleep quality was associated with greater nocturnal SBP, but the association became non-significant after multiplicity adjustment. No other actigraphy-assessed or self-reported sleep variables were associated with 24-hour BP or cfPWV.
Conclusion: Our findings suggest greater time spent awake after initial sleep onset may influence nocturnal blood pressure. The relationship between WASO and nocturnal BP should be further explored as targeting decreasing time spent awake after sleep onset could potentially lower nocturnal BP in desk workers.
Support (if any): Research supported by NIH grants R01HL134809 and R01HL147610

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0353

SHINING LIGHT ON PHOTIC MEASUREMENT FOR SLEEP AND CIRCADIAN FIELD STUDIES

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Introduction: Light is the most potent signal for the circadian regulation of sleep. To quantify light's biological impact via melanopic Equivalent Daylight Illuminance (EDI), photic intensity is weighted based on the spectral sensitivity of melanopsin. This metric for light and time-of-day specific threshold recommendations support development, standardization, and replication of studies of the physiological effects of light. Light measurement outside the lab poses many unique challenges (e.g. greater variability in timing, intensity, spectrum; individual factors; technology limitations). Thus, consistent methods for measurement and reporting are important for maximizing the utility of emerging tools.
Methods: A framework for assessing and reporting light in field studies was developed, incorporating: 1) factors that influence light exposure, 2) methods for capturing the most significant factors, 3) strategies for addressing unique tradeoffs and challenges, and 4) an initial step-by-step protocol for measuring and reporting lighting characteristics in field studies of the physiological effects of light. This framework was applied in multiple study protocols to inform development and refinement.
Results: All studies used both static and continuous measures, along with subjective assessments. In one study, lighting was not homogenous and therefore position and location in the space mattered (melanopic EDI seated vs standing, 133.84 vs 221.91 lux; between workstations (seated), 133.84 vs 62.29 lux). In a second study, lighting was more homogenous but varied by time-on-shift; thus, continuous measures with a stationary meter were used. In a third study, subjective assessment of behaviors that influence photic exposure patterns over the past month indicated individuals likely did not meet nighttime light recommendations (melanopic EDI < 1 lux): 73% used their phone in bed often or always before sleep; and 20% often or always checked their phone if awakened from sleep.
Conclusion: When measuring and reporting light in the field, a one-size-fits-all approach is impossible, but some level of standardization is necessary. The proposed multi-level framework expands on recent lab-based guidelines by making adaptations for field studies, facilitating the evidence-based translation of our fundamental understanding of the effects of light on sleep and circadian health.
Support (if any): CDMRP JPC-5 Fatigue Countermeasures Working Group (#66619).

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0354

EARLY TO BED AND EARLY TO RISE? A COMPARISON OF ACTIGRAPHY-DERIVED SLEEP AND CIRCADIAN TIMING ACROSS CHRONOTYPES

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Introduction: Evening chronotype is associated with increased risk for depression and suicide-related outcomes. This may be due to circadian-sleep misalignment, as previous studies have found chronotype-related differences in the relative timing between circadian phase (i.e., dim light melatonin; DLMO) and sleep. However, such differences may be attributable to variation in intrinsic circadian period length across chronotypes, rather than reflect actual circadian misalignment among those with an evening chronotype. The present study sought to compare predicted circadian and sleep timing across chronotypes using a light-based mathematical model of the human circadian pacemaker that controlled for intrinsic period length.
Methods: This was a secondary analysis of the Multi-Ethnic Study of Atherosclerosis (MESA) Sleep and the Hispanic Health Study / Study of Latinos (HCHS/SOL) Sueño datasets. Scores on the Reduced Morningness-Eveningness Questionnaire were grouped into "morning," "intermediate," and "evening" chronotypes. Sleep timing was determined by actigraphy and DLMO was predicted (pDLMO) from light and sleep/wake states using the extended Kronauer model. Circadian-sleep alignment was calculated as the timing between pDLMO and either sleep onset or offset (i.e., phase angles). Multivariate analyses of covariance (MANCOVAs) were used to evaluate the associations between chronotype and the timing/alignment of circadian and sleep variables, with post-hoc comparisons conducted using non-parametric bootstrapping.
Results: MANCOVAs identified chronotype differences in sleep onset, pDLMO, and pDLMO-sleep onset phase angles in both datasets. Chronotype was associated with pDLMO-sleep offset phase angles in MESA Sleep only. pDLMO and sleep onset were ~1-2 hours later for participants with an evening chronotype ($p < .001$ for all). In MESA Sleep, participants with an evening chronotype had a pDLMO-sleep onset phase angle that was ~30 minutes (95% CI: 13.5, 46.9; $p = .002$) shorter than those with a morning chronotype; in HCHS/SOL Sueño, it was ~17 minutes (95% CI: 3.6, 29.1; $p = .033$) shorter.
Conclusion: Assuming equal intrinsic periods, participants with an evening chronotype had a light exposure profile that predicted sleep onset at an earlier circadian phase than those with a morning or intermediate chronotype. These findings provide further evidence that an evening chronotype may be associated with chronic circadian-sleep misalignment.
Support (if any): None

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0355

DONNING SUNGLASSES AT NIGHT: ADVANCING FASHION AND CIRCADIAN PHASE OF ADOLESCENTS

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Introduction: Previously, we reported that evening room light and sleep restriction due to late bedtimes can reduce the expected circadian phase advances in response to morning bright light in adolescents or can shift rhythms later (delay). Here, we examine whether reducing evening light with sunglasses can rescue this effect and help rhythms shift earlier (advance).
Methods: So far, 57 adolescents (29 females; 14.1-18.0 years) completed a 14-day protocol. On days 1-7, they kept individualized 10-h sleep/dark schedules at home. On days 8-14, they lived in the laboratory. On day 8, we measured their Dim Light

Melatonin Onset (DLMO). On days 9-10, they went to bed 1.5h, 3.0h, or 4.5h later. Wake time was unchanged; thus, sleep opportunity was 8.5h, 7h, and 5.5h, respectively. In each sleep restriction group, participants remained awake in room light (104±11 photopic lux; 8.5h n=9; 7h n=12; 5.5h n=8) or wore amber-lensed sunglasses (transmitted 14% of light and 10% of short wavelength light; 8.5h n=5; 7h n=4; 5.5h n=9). A control group (n=10) kept their baseline bedtime, so was not exposed to additional evening light or sleep restriction. On days 11-13, sleep/dark was gradually shifted earlier, and adolescents received three 30-min exposures of bright light (8599±885 photopic lux) upon waking. Final DLMO was measured on day 14. Multiple linear regression examined sleep restriction dose, sunglasses, and the dose-by-sunglasses interaction effects on phase shift.

Results: The control group advanced +2.1±1.0h. Greater sleep restriction reduced phase advances (dose: β=-1.31, p<.001), but evening sunglasses attenuated this effect (dose-by-sunglasses: β=1.01, p<.05). When sleep/dark was 8.5h, sunglasses produced larger advances (+1.3±0.6h) compared to no sunglasses (+0.5±0.6h) [t(12)=-2.4, p=.04]. Compared to no sunglasses, evening sunglasses prevented delays when sleep/dark was 7.0h (-0.8±1.1h vs +0.5±0.9; t(14)=-2.2, p=.04) and 5.5h (-2.6±1.2h vs +0.0±1.1h; t(15)=4.8, p<.001). With evening sunglasses and 7.0h or 5.5h sleep/dark, advances were still smaller than control (p's≤.01).

Conclusion: Reducing evening light with amber-lensed glasses during a phase-advancing protocol with morning bright light facilitates larger advances or prevents delays in adolescents. However, ≤7h sleep/dark reduces phase advances in response to morning bright light even when evening light is reduced.

Support (if any): R01HL146772 (Crowley)

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0356

LUNCH WITH A SIDE OF LIGHT: CAN AFTERNOON BRIGHT LIGHT SHIFT CIRCADIAN PHASE EARLIER IN OLDER ADOLESCENTS?

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Introduction: Previous work shows an association between afternoon bright light exposure and early circadian phase in adults (Van der Maren et al, 2018; Wilson et al, 2018). Our phase response curve (PRC) to bright light in adolescents also suggests a novel phase advancing region in the afternoon (Crowley & Eastman, 2017). Here, we examined phase shifts in response to bright light timed in the afternoon.

Methods: So far, 30 older adolescents (15F) aged 18.3-20.9 years completed a 13-day protocol during the academic year. On days 1-7 (baseline), participants kept a 9-h individualized sleep schedule at home and then lived in the lab on days 8-13. On day 8, baseline Dim Light Melatonin Onset (DLMO) was measured. After one night (day 9) on their individualized 9-h sleep schedules, sleep/dark advanced by 1h each day on days 10-12. The afternoon bright light (ABL) group (n=18) received 3h of bright intermittent light (four 45-min bright light exposures (8512±795 lux) alternated with 15-min room light exposures (43±24 lux)) in the afternoon on 3 days (days 10-12). Day 10 bright light began 5h after baseline wake time, with the goal of timing bright light 4-7h before baseline DLMO. Subsequent exposures were advanced by 1h daily. The room light (RL) group completed the same protocol, except they remained in room light throughout. Final DLMO was assessed on day 13.

Results: Both the RL and ABL group displayed a phase advance (0.8±0.6; 0.9±0.6, respectively), but groups did not differ [t(27)=0.13, p=0.90]. Post-hoc analysis revealed that participants whose day 10 light exposure ended within the target afternoon phase advancing region (4-7h before baseline DLMO) advanced more (1.0±0.2, n=13) than individuals whose day 10 bright light ended closer in time to baseline DLMO (0.4±0.1, n=5) [t(16)=2.11, p=0.05].

Conclusion: Gradually shifting sleep/dark earlier over 3 days advanced circadian phase by ~1h, and the administration of afternoon bright light did not significantly increase the magnitude of this advance. Afternoon bright light timing, however, may have been too late in some adolescents. Ambient light history and sleep quality will be examined as other potential causes for the insignificant difference.

Support (if any): R01HL151512 (Crowley)

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0357

OLDER ADULTS' SLEEP QUALITY: NAVIGATING THE IMPACT OF DAILY LIGHTING AND THERMAL CONDITIONS IN LIVING ENVIRONMENTS

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Introduction: Epidemiological studies have revealed that sleep complaints are prevalent among older adults. Poor sleep quality in older adults is linked with higher levels of depression, anxiety, agitation, and falls as well as diminished cognitive and memory performance. Previous inquiries reported lighting and thermal conditions in residential spaces as important environmental factors impacting sleep in various populations. This study aims to explore how daily lighting exposure and thermal conditions within the residences of older adults influence their sleep quality.

Methods: A three-day cross-sectional study was conducted. Participants were 18 older adults (age > 54 years old) living independently in a senior living facility in Phoenix, AZ. Data collection was conducted in the participants' residence unit in the facility without any intervention. Non-invasive wearable devices, including actigraphs and light trackers, were employed to measure sleep quality (duration and efficiency) and daily light exposure (intensity, correlated color temperature (CCT), and Melanopic Equivalent Daylight Illuminance (MEDI)) over the course of three consecutive days. In addition, sensors installed in living rooms and bedrooms continuously monitored indoor temperature and light intensity. The data underwent rigorous analysis, employing statistical tools such as ANOVA and correlation, executed using software platforms like SPSS, Minitab, and SAS. Predictive models were developed utilizing machine learning algorithms and deep learning techniques within Python's TensorFlow framework.

Results: The results revealed that average daytime MEDI predicted total sleep time significantly. Average daytime CCT and nighttime bedroom temperature had no significant impact on sleep duration. Higher average nighttime bedroom temperature was associated with reduced sleep fragmentation (b = -.493, t(8.52) = -.314, p = .0128) and improved sleep efficiency (b = .025, t(11.6) = 2.89, p = .0141). In terms of temperature and sleep duration, nighttime temperature displayed a significant negative correlation with sleep hours. The regression model

explained 31% of the variance in sleep hours, highlighting the significance of nighttime temperature in sleep duration.
Conclusion: This study underscores the importance of optimizing bedroom temperature and increasing daytime light exposure to enhance sleep quality. These findings offer practical strategies for improving the sleep patterns and overall well-being of older adults in residential settings.
Support (if any): National Science Foundation (Grant Number:R-23-0018)

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0358

EFFECTS OF CHRONOTYPE-TAILORED BRIGHT LIGHT INTERVENTION ON POST-TREATMENT SYMPTOMS IN BREAST CANCER SURVIVORS

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Introduction: Many cancer-related symptoms emerge or amplify during cancer treatment and persist long after treatment terminates. Bright light therapy holds promise for reducing symptoms, e.g., sleep disturbance, that are commonly experienced by individuals with cancer. This study aimed to examine the effects of a chronotype-tailored bright light intervention on sleep disturbance, fatigue, depressive mood, and cognitive dysfunction among post-treatment breast cancer survivors.
Methods: Thirty women with stage I-III breast cancer 1-3 years post-completion of chemotherapy and/or radiation (mean age= 52.5 ± 8.4 years, 93% White) participated in this two-group randomized controlled trial. Participants were randomized to receive either 30-minute bright blue-green light at 12,000 lux (intervention; n=15) or dim red light at 5 lux (control; n=15) daily for 14 consecutive days. Timing of light exposure, either between 19:00-20:00 hours or within 30 minutes of waking in the morning, was tailored based on individuals' chronotypes (by Horne-Ostberg Morningness-Eveningness Questionnaire). Self-reported symptom outcomes (e.g., sleep disturbance measured by Pittsburgh Sleep Quality Index) and in-lab overnight polysomnography sleep study were assessed before (pre-test) and after the 14-day light intervention (post-test). Linear mixed models (for continuous outcomes) or generalized estimating equations with cumulative log link function (for ordinal outcomes) were fitted to examine between-group differences, while adjusting for correlation among repeated measures.
Results: There were no significant between-group differences in any of the symptom outcomes (all $p>0.05$). However, within each group, self-reported sleep disturbance, fatigue, depressive mood, and cognitive dysfunction showed significant improvements over time (all $p< 0.05$); especially, the extent of improvement for fatigue and depressive mood was clinically relevant. Polysomnography sleep findings showed that number of awakenings significantly decreased ($p=0.011$) among participants receiving bright light, while stage 2 sleep significantly increased ($p=0.015$) among participants receiving dim-red light.
Conclusion: The findings support using light therapy to manage post-treatment symptoms in breast cancer survivors. In contrast to our hypothesis, the study results are equally favorable to bright light and dim light condition. The unexpected symptom improvements among dim-red light controls remain unexplained and requires further investigation.
Support (if any): NIH R15NR016828

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0359

COMORBID INSOMNIA AND SLEEP APNEA: MORTALITY TRENDS IN A LARGE NATIONAL COHORT OF US VETERANS

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Introduction: Comorbid insomnia and sleep apnea (COMISA) is a prevalent condition among veterans. Insomnia and sleep apnea (SA) may be diagnosed concurrently or on separate occasions (e.g., concurrent diagnoses, insomnia first, or OSA first). No study has investigated temporal sequences, time intervals, or health-associations of diagnostic intervals in people with COMISA. We examined these patterns of COMISA diagnoses in a large longitudinal clinical database.

Methods: We used ICD 9/10 codes to identify veterans with confirmed diagnosis of insomnia or SA. We used previously validated confirmed diagnosis algorithm. For insomnia, we further required evidence of treatment (medications or CBT-I). Time interval between the two diagnoses was defined in months (30 days), delta-month. We calculated the odds ratio of all-cause mortality followed for 36 months adjusting (aOR) for age, sex, race, ethnicity, Charlson Comorbidity Index (CCI) and exposure time (time from index insomnia or SA diagnosis) using patient with concurrent diagnosis as the reference (delta-month=0).

Results: We identified 303,803 people with COMISA with prevalence of 14.1% (Age 52.5, male 89.2, BMI 32.4±6.1, White 68.3%, CCI≥2 18.5%). 11,396 (3.8%) had both conditions diagnosed concurrently, 153,386 (50.5%) had insomnia followed by later SA diagnoses, and 139,021 (45.7%) had SA followed by later insomnia diagnoses. All-cause mortality rates were lowest among the concurrent diagnosis group (13%) and increased with larger time intervals between diagnoses (either insomnia-first, or OSA-first). Mortality rates increased to 16% from 5 to 14 months and reached 17% in ≥15 months. The aOR for mortality increased with greater delta-month up to 5 months, then plateaued from 5-14 months (1.19±0.03) and further rose and plateaued thereafter (1.24±0.05).

Conclusion: In COMISA, the timing of each diagnosis is heterogenous and may be associated with health outcomes. Mortality rates increase with wider time intervals between the two diagnoses, regardless of which condition is diagnosed first. Further exploration of mechanisms underlying this association of increased diagnostic delta and higher mortality risk in people with COMISA is warranted.

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0360

OBSTRUCTIVE SLEEP APNEA AND RISK OF INSOMNIA AMONG DIVERSE PATIENT POPULATIONS

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Introduction: Concurrent obstructive sleep apnea (OSA) and insomnia have been reported in cross-sectional studies suggesting that 50% of adults with OSA experienced insomnia symptoms, while 43% of adults with insomnia symptoms had OSA. However, prospective studies reporting associations between these two sleep disorders are uncommon. Therefore, this study sought to examine associations between OSA on subsequent insomnia diagnosis among a diverse cohort of adult women and men.

Methods: We utilized electronic health records of 1,971,279 patients age 40+y who obtained care at a large US-based medical center. Patients were stratified into three groups based on self-reported race/ethnicity: Whites, Blacks and Arab-Americans. To create the Arab American group, we implemented a name-based algorithm that has been developed and validated to identify Arab ethnicity. Diagnosis of OSA and insomnia based on ICD-10 codes, as well as age at diagnosis were extracted from medical records. Robust (modified) Poisson regression models, adjusting for sex, race/ethnicity, current age, smoking behavior and age at diagnosis for patients with OSA, were utilized to study the association between OSA and insomnia diagnosis. Effect modification by race/ethnicity was also examined.

Results: The mean age of patients was 66y and over half were women (54%). The cohort was predominately White (87%) and 3% were Arab-Americans. The prevalence of OSA was 4.8%, 5.1% and 3.5% for Whites, Blacks and Arab-Americans, respectively. Overall, patients with OSA were more likely to have insomnia than those without OSA (RR = 6.9, 95% CI: 6.3, 7.5). In addition, we found statistically significant evidence for racial/ethnic differences in the association (p-values for interaction < 0.05). Further racial/ethnic-stratified analysis revealed that, the risk of insomnia for OSA patients increased by 11-fold among Arab-Americans (95% CI: 6.5, 19.2), 7-fold among Whites (95% CI: 6.2, 7.5), and 5-fold among Blacks (95% CI: 3.8, 6.9).

Conclusion: In a large and diverse sample of patients, we found significant positive associations between OSA and insomnia, which were differential among ethnic and racial groups. Arab-Americans with OSA were the most vulnerable to insomnia. These findings suggest ethnic and racial disparities in sleep disorders among Arab-Americans.

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0361

A NOVEL LONGITUDINAL APPROACH TO EVALUATING COMORBID INSOMNIA AND SLEEP APNEA IN INDIVIDUALS TESTED FOR SLEEP APNEA

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Introduction: Comorbid insomnia and sleep apnea (COMISA) is a debilitating disorder marked by a bi-directional relationship between obstructive sleep apnea (OSA) and insomnia. To explore this relationship, we employed a novel approach to evaluate metrics associated with comorbid-insomnia (sleep maintenance) in individuals who tested for OSA with a longitudinal (multi-night) home sleep test.
Methods: 3,370 tests were evaluated (1,358 participants; mean age 49.73 years, SD 15.0; mean tests/participant 3.1, SD 4.5). OSA was measured by apnea/hypopnea index (AHI) and hypoxic burden (HB). ANOVA and PCC (99% CI) were used to evaluate the relationship between SA severity and measures of comorbid-insomnia (total sleep time (TST), sleep efficiency (SE), wake after sleep onset (WASO), #awakenings (#W), %light sleep (%L), %REM sleep (%REM)).
Results: TST ($F[3,3357]=5.21$; $p< 0.001$), SE ($F[3,3357]=16,12$; $p< 0.001$), and %REM ($F[3,3357]=2.84$; $p=0.014$) decreased, and #W ($F[3, 3357]=3.20$; $p< 0.001$), WASO ($F[3, 3357]=15.22$; $p< 0.0001$) and %Light ($F[3,3357]=3.40$; $p< 0.0001$) increased with AHI severity. Between normal (AHI 0-4.99) and mild (AHI 5-14.99) tests, SE (-2%; $p=0.005$) decreased, and #W (+1.05; $p=0.01$) and WASO (+10.3 min; $p< 0.0001$) increased. The largest change occurred between normal and severe (AHI >30) tests (TST -28.65 min; WASO +27.15 min). AHI and HB were positively correlated ($r=0.67$; $p< 0.0001$). AHI was weakly, but significantly, correlated with TST ($p< 0.0001$), SE ($p< 0.0001$), #W ($p< 0.0001$), and WASO ($p< 0.0001$). HB was correlated with SE ($p< 0.0001$), #W ($p< 0.0001$), and WASO ($p< 0.0001$).
Conclusion: Comorbid-insomnia measures increased with SA severity at all levels, suggesting that the presence of OSA at any severity is a risk factor for COMISA. Further analysis is required to determine if the presence of SA and the impact of HB are the primary factors driving COMISA. Contextual issues surrounding the sleep period need to be addressed.
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0362

OBSTRUCTIVE SLEEP APNEA, INSOMNIA AND A NOVEL APPROACH TO SEPARATING DANGEROUS BEDFELLOWS – JUST "ASHQ"

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Introduction: Obstructive sleep apnea (OSA) can lead to numerous adverse health sequelae, increased medical costs and impaired quality of life, and insomnia may have similar consequences. The frequent co-occurrence of OSA and insomnia (comorbid insomnia and sleep apnea, COMISA) results in a bi-directional, synergistic relationship with greater symptomatology and refractory treatment outcomes. Poor sleep hygiene may directly contribute to insomnia, and identifying and correcting maladaptive sleep habits could improve sleep and management of COMISA. Numerous questionnaires are available to measure subjective sleepiness, fatigue and sleep quality, but there are no sleep hygiene surveys to identify the plethora of contemporary, maladaptive lifestyle behaviors that may contribute to insomnia. An instrument to detect detrimental sleep habits could help COMISA patients to optimize sleep hygiene, improve insomnia, and enhance treatment.
Methods: We recently developed a sleep hygiene questionnaire (Atlantic Sleep Hygiene Questionnaire, ASHQ) consisting of 20 detrimental sleep habits based on a critical analysis of the current sleep hygiene literature. In a prior validation study, ASHQ score strongly correlated with sleepiness, fatigue and subjective sleep quality in 700 adult patients with various sleep-related diagnoses. We now administered the ASHQ to a new cohort of 80 patients with only OSA. Patients also completed a single item sleep quality assessment (Sleep Quality Score, SQS) and a screening tool for insomnia (Insomnia Severity Index, ISI). ASHQ scores were summarized and compared to SQS and ISI survey results, and correlations were analyzed for each assessment.
Results: ASHQ and ISI scores were elevated in a majority of OSA patients, consistent with COMISA. ASHQ scores were significantly associated with SQS and ISI scores. There was a direct correlation between detrimental sleep habits, sleep quality and insomnia, confirming the validity of the ASHQ to assess sleep hygiene and its potential risk in patients with OSA and COMISA.
Conclusion: The ASHQ is a novel instrument to assess sleep hygiene, and ASHQ scoring strongly correlates with both sleep quality and insomnia in patients with OSA. ASHQ may be a useful tool to identify COMISA, improve sleep hygiene and concomitant insomnia, and facilitate treatment of underlying OSA.
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0363

INSOMNIA WITH SHORT SLEEP DURATION IS ASSOCIATED WITH INCREASED CATECHOLAMINE SECRETION IN YOUNG ADULTS

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Introduction: Prior studies have shown insomnia to be associated with increased sympatho-adrenal-medullary (SAM) axis activity, as indexed by higher 24-hour urinary catecholamine secretion. These studies also showed that the activity of both axis of the stress system in those with insomnia is positively related to the degree of polysomnography (PSG)-measured sleep disturbance, ascertained by four consecutive nights. However, these pathophysiologic findings have not been replicated in population-based samples.
Methods: We studied 270 young adults (median 25y, 53% female, 24% racial/ethnic minority) from the Penn State Child Cohort who underwent a 9-hour PSG recording, clinical history, self-report scales and provided a urine sample upon awakening from the PSG to assay for 8-hour release of catecholamines (i.e., epinephrine, norepinephrine, and dopamine). Insomnia symptoms were defined as difficulties initiating or maintaining sleep, insomnia diagnosis or complaint, and/or sleep medication use. PSG-measured short sleep duration was defined by the median total sleep time of the sample (i.e., < 7-h), and identified normal sleep duration (NSD), short sleep duration (SSD), insomnia with normal sleep duration (INSD) and insomnia with short sleep duration (ISSD). A multivariate general linear model tested mean differences in catecholamine levels across the four groups while adjusting for sex, race/ethnicity, age, waist

circumference, sleep apnea, cardiometabolic disorders, medication and substance use.
Results: Compared to NSD (18.8±1.5) and INSD (20.9±1.1), ISSD showed significantly higher total epinephrine/norepinephrine levels (24.0±1.1; p=0.007 and p=0.046, respectively). This association was primarily driven by higher norepinephrine levels in ISSD (3.1±0.3) compared to NSD (2.2±0.5; p=0.018). Neither INSD (p=0.260) nor SSD (21.4±1.7; p=0.255) showed significantly elevated levels compared to NSD. There were no significant differences in dopamine levels across groups [e.g., NSD (238.1±10.8) vs. ISSD (241.6±7.6); p =0.809].
Conclusion: ISSD, but not INSD, is associated with higher morning norepinephrine levels, suggesting hyperactivity of the SAM axis of the stress system and increased risk for cardiovascular and psychiatric disorders.
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0364
THE ROLE OF HYPERAROUSAL IN SLEEP-WAKE STATE DISCREPANCY IN YOUTHS WITH INSOMNIA

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Introduction: Sleep-wake state discrepancy, characterized by a difference in objectively and subjectively evaluated sleep, is common among individuals with insomnia. While it was hypothesized that hyperarousal might play a role, there has been limited research to examine self-reported pre-sleep arousal and objectively measured cortical arousal in youth insomnia. The current study aimed to explore the potential differences in subjective and objective hyperarousal between youths with insomnia and healthy sleepers, and to examine whether hyperarousal mediated the association between sleep-wake state discrepancy and insomnia severity.
Methods: Sixty-six youths with DSM-5 insomnia disorder (age:20.03±2.31; female: 62.12%) and 40 healthy controls (age:19.52±2.25; female: 65%) were included. Participants completed a 7-day prospective sleep diary and actigraphy monitoring, a single-night in-lab polysomnography assessment, and self-reported questionnaires including Insomnia Severity Index for the measure of insomnia severity and Pre-sleep Arousal Scale (PSAS) for the measure of cognitive and somatic hyperarousal. The discrepancy sleep indices were computed by subtracting the data from 7-day actigraphy and sleep diary, where a positive value indicated a subjective underestimation.
Results: There was a significant group difference in sleep-wake state discrepancy in sleep onset latency (13.71 minutes overestimation in the insomnia group vs. 7.44 minutes underestimation in the control group). Moreover, relative to the healthy control group, the insomnia group showed significantly more severe insomnia (p<.01) and higher levels of pre-sleep cognitive and somatic arousal (p<.01), beta-band activity in non-rapid eye movement stage 1 (p<.05), stage 2 (p<.05), and rapid-eye movement stage (p<.05). Subjectively reported pre-sleep cognitive and somatic arousal, but not objective arousal indices, were found to mediate the association between sleep-wake state discrepancy in sleep onset latency and insomnia severity (ab=-0.39, p<.01).
Conclusion: Both subjectively and objectively measured hyperarousal is present in youth insomnia. The mediating effect of subjective pre-sleep arousal on the association between sleep-wake state discrepancy and insomnia severity warrants further neuroimaging research on its underlying mechanism. Future studies should also consider exploring the effects of insomnia treatment on self-perceived sleep-related arousal and sleep-wake state discrepancy in youth.
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0365
FAILURE TO REDUCE GLUTAMATE LEVELS IN MEDIAL PREFRONTAL CORTEX DURING NREM SLEEP COULD CAUSE TRANSIENT INSOMNIA

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Introduction: While the social burden of insomnia is substantial, neurochemical mechanisms underlying it are poorly understood. Animal studies suggest the involvement of the medial prefrontal cortex (mPFC) in sleep-wake regulation through glutamatergic and GABAergic signaling. However, the specific roles of these neurotransmitters in human insomnia remain unclear. This study utilized the First-Night Effect (FNE)—a transient sleep disturbance observed during initial sleep experiments— as an insomnia model using healthy participants. To achieve this, we compared the concentrations of glutamate and GABA in the mPFC observed during the first and second sleep sessions using functional Magnetic Resonance Spectroscopy (MRS).
Methods: Twenty healthy adults (12 females), aged 18-30, participated in the experiment involving two afternoon-nap sessions (Day-1 and Day-2), separated by approximately one week. It was anticipated that sleep would be affected by the FNE on Day-1, but not on Day-2. During each session, participants slept inside the MRI while 90-min polysomnography was conducted. Within this period, nine 10-min MRS scans were performed to measure the glutamate (Glx) and GABA concentrations in the mPFC. The Changes in Glx and GABA concentrations during NREM sleep were calculated relative to wakefulness baseline, following the temporal co-registration between MRS data and sleep stages. Sleep onset latency (SOL) served as a sleep quality indicator.
Results: The SOL was significantly longer on Day-1 than Day-2, indicating poorer sleep on Day-1. On Day-2, a significant Glx level decrease from wakefulness to NREM sleep was observed, strongly correlating with SOL. This relationship suggests a close association between reduced Glx levels and shorter SOL. Conversely, there was no substantial Glx level decrease during NREM sleep on Day-1, although a significant correlation between Glx reduction and SOL was present. Mediation analysis revealed that glutamate levels mediated SOL differences between the two sessions. In contrast, GABA levels remained unchanged during NREM sleep from baseline with no significant correlation with SOL on each session.
Conclusion: These findings suggest that the failure to reduce glutamate concentrations, rather than the failure to increase GABA

is linked to the FNE. A similar mechanism might contribute to the development of certain types of transient insomnia.
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0366
INSOMNIA IN STATE MEDICAID ADMINISTRATIVE CLAIMS: MISSED OPPORTUNITY FOR IMPLEMENTATION AND DISSEMINATION?

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Introduction: It is well-established that insomnia is more prevalent in under-resourced communities, which is further exacerbated by the limited access to treatment. To address this health need, essential health care services are made available by the government to those without the financial resources to purchase them (e.g., Medicaid). However, it is unclear if services for insomnia are available and accessible even within these programs. This study aimed to estimate the prevalence and patterns of diagnosis of insomnia among recipients of a state Medicaid program.
Methods: We accessed Medicaid administrative data through the state data warehouse to identify beneficiaries who had a service between 11/1/2019 and 10/31/2023 with a diagnosis code for sleep problems. We calculated the prevalence of sleep-related diagnoses out of the total number of beneficiaries with enrollment during the study period.
Results: Of 3.7 million beneficiaries, 310,092 had at least one service during the study period with a sleep problem diagnosis code, for a prevalence of 8.25%. Their most common sleep problem diagnosis codes were G4700-INSOMNIA, UNSPECIFIED (5.65%), F5101-PRIMARY INSOMNIA (1.14%), G479-SLEEP DISORDER, UNSPECIFIED (0.82%), and F5102-ADJUSTMENT INSOMNIA (0.27%). Among beneficiaries with at least one sleep problem diagnosis code, 55.10% had diagnosis codes in the past 6 months indicating a significant mental health condition, substance use disorder, or neurologic condition; and 6.80% had a diagnosis of shift work disorder, free running type and/or restless leg syndrome in the past 48 months.
Conclusion: Other health care administrative datasets have estimated the prevalence of insomnia diagnoses at ~30-35%; in comparison, these findings suggest that insomnia may be severely underdiagnosed and treated among Medicaid beneficiaries. This is a significant missed opportunity for implementation and dissemination of insomnia treatment for low-income adults with Medicaid coverage.
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0367
THE INDEPENDENT AND INTERACTIVE EFFECTS OF INSOMNIA SYMPTOMS AND SHORT SLEEP ON SLEEP PHYSIOLOGY

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Introduction: The presence of subjective insomnia complaints with objective short sleep duration (total sleep time [TST] < 6 hours/night) has been associated with more severe health outcomes compared to insomnia or shortened sleep alone. The differential and possibly interacting effects of insomnia and shortened sleep on sleep physiology have not yet been comprehensively characterized.
Methods: 1,014 participants from the Sleep Apnea Global Interdisciplinary Consortium (SAGIC) without sleep apnea (apnea-hypopnea index < 5 events/hour) were included. Participants were categorized as having insomnia or good sleepers based on self-reported symptoms and as short (< 6 hours/night) or normal (≥6 hours/night) sleepers based on in-laboratory TST. Analysis of variance models adjusted for age and sex assessed the effects of insomnia, shortened sleep, and their interaction on traditional sleep architecture (percent of TST in each sleep stage), EEG power metrics, and novel odds ratio product (ORP; indexes sleep depth ranging from 0 [deep sleep] to 2.5 [full wakefulness]) metrics (average ORP in each sleep stage and ORP-9 [speed with which sleep deepens following arousal]).
Results: Neither insomnia status, sleep duration, nor their interaction had significant effects on the percent of TST spent in any sleep stage. The interaction between insomnia status and sleep duration was not significant for any ORP or EEG metrics. However, individuals with insomnia demonstrated lighter sleep (higher NREM ORP [p=0.02, $\eta2$=0.01], REM ORP [p =0.002, $\eta2$=0.02], and ORP-9 [p=0.0002, $\eta2$=0.03]), cortical hyperarousal (higher beta power in 14-20 Hz [p=0.0003, $\eta2$=0.03] and 20-35 Hz [p=0.001, $\eta2$=0.02]), and higher sigma power (12-16 Hz [p=0.04, $\eta2$=0.01]) compared to good sleepers. Short sleepers also demonstrated lighter REM sleep (higher ORP [p=0.0004, $\eta2$=0.03]) and cortical hyperarousal (higher beta power in 14-20 Hz [p< 0.0001, $\eta2$=0.04] and 20-35 Hz [p< 0.0001, $\eta2$=0.04]) as well as lower delta power (1-4 Hz [p=0.0009, $\eta2$=0.02]) and theta power (4-7 Hz [p< 0.0001, $\eta2$=0.05]) relative to normal sleepers.
Conclusion: While insomnia and shortened sleep did not influence traditional sleep architecture, they were differentially associated with alterations in sleep physiology. These more granular metrics may be useful in future investigations of potentially separable mechanisms that underlie adverse health consequences in insomnia versus shortened sleep.
Support (if any):

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0368
PREVALENCE OF INSOMNIA IN PATIENTS WITH HYPOGLOSSAL NERVE STIMULATION (HNS) AT A TERTIARY CARE SLEEP CENTER

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Introduction: Insomnia is a sleep disorder that may be under diagnosed and under treated. We reviewed insomnia type in patients who underwent implantation of Hypoglossal Nerve Stimulation (HNS). Hypoglossal nerve stimulation (HNS) is an efficacious option for treating obstructive sleep apnea although there is evolving literature regarding coincidental prevalence of insomnia in this select group of patients.
Methods: A retrospective, single-center, cohort study used medical records from Sept 2017- March 2023 of 144 participants (28% Female, n=40) with HNS. Analysis included insomnia diagnosis date, comorbidities, and the insomnia type. Effective OSA mitigation was defined by < 15 AHI or >50% reduction

from baseline AHI and AHI is < 20 with HNS device. HNS adherence and device usage was reviewed at 90 days and 180 days. HNS compliance was assessed using SleepSync™ software.
Results: Of the 144 participants, 30 adults had insomnia (21%). Of the type of insomnia, Psychophysiological (33%, n=10), Sleep onset (27%, n=8), and Sleep maintenance (17%, n=5) were the most frequently diagnosed. Psychophysiological insomnia was unmasked in 33% of the patient after HNS implantation while sleep onset insomnia was reported prior to HNS implantation in 24% of the patients. In the psychophysiological group, 3 patients tolerated HNS after treatment of insomnia although five patients were lost to follow up and two patients had their HNS explanted. The group with psychophysiological insomnia had an increase of pauses on their HNS device at 180 days compared to at 90 days.
Conclusion: Of the 144 participants, 30 adults had insomnia (21%). Of the type of insomnia, Psychophysiological (33%, n=10), Sleep onset (27%, n=8), and Sleep maintenance (17%, n=5) were the most frequently diagnosed. Psychophysiological insomnia was unmasked in 33% of the patient after HNS implantation while sleep onset insomnia was reported prior to HNS implantation in 24% of the patients. In the psychophysiological group, 3 patients tolerated HNS after treatment of insomnia although five patients were lost to follow up and two patients had their HNS explanted. The group with psychophysiological insomnia had an increase of pauses on their HNS device at 180 days compared to at 90 days.
Support (if any): None

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0369

MORTALITY IN VETERANS WITH INSOMNIA, SLEEP APNEA AND COMORBID INSOMNIA AND SLEEP APNEA (COMISA): A COHORT STUDY

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Introduction: Insomnia and Sleep Apnea (SA), the two most prevalent sleep disorders, can occur separately or concurrently as comorbid insomnia and sleep apnea (COMISA). This study utilized a large national Veterans Health Administration (VA) database to compare all-cause mortality among them.
Methods: We constructed a cohort of veterans who used any sleep services in the VA from 10/1999 to 10/2023. Using ICD 9/10 codes and a VA-validated algorithm, we identified veterans with confirmed diagnoses of insomnia and/or SA. For insomnia, we required the presence of relevant medications or CBT-I. We extracted mortality data for three groups: insomnia-only, SA-only, and COMISA. We estimated the association of these conditions using multivariable logistic regression, adjusting for age, sex, race, ethnicity, Charlson Comorbidity Index (CCI), and exposure time (time from the initial insomnia or SA diagnosis).
Results: Out of 4,722,693 veterans who used VA sleep services, we identified 2,159,412 participants with a confirmed diagnosis of either SA or insomnia, who had ≥2 specialty visits in the past three years. We observed 518,574 (24%) with insomnia-only (mean age 58.5, 77.2% male, 71.4% white, 22.6% with CCI > 2), 1,343,035 (63%) with SA-only (mean age 57.6, 93.5% male, 70.1% white, 25% with CCI > 2), and 297,803 (13.8%) with COMISA (mean age 52.5, 89.2% male, 68.3% white, 18.5% with CCI > 2). All-cause mortality rates were 33.2%, 23.3%, and 16.2% for insomnia-only, SA-only, and COMISA, respectively. Compared to the SA-only group as a reference, the insomnia-only group was associated with a 73% increased risk (adjusted Odds Ratio [aOR] 1.73; 95% Confidence Interval [CI]: 1.72, 1.75) and the COMISA group with a 12% decreased risk of mortality (aOR 0.88; 95%CI: 0.87, 0.89).
Conclusion: In a cohort referred to VA sleep centers, SA, insomnia, and COMISA were prevalent. Mortality was highest in the insomnia-only group, compared to the SA-only and COMISA groups. Further studies are needed to explore the causes of this increased mortality.
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0370

SHORT SLEEP DURATION MODIFIES THE ASSOCIATION OF OBSTRUCTIVE SLEEP APNEA AND INSOMNIA SYMPTOMS WITH BIOMARKERS

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Introduction: Co-morbid insomnia and obstructive sleep apnea (COMISA) have been shown to be associated with higher risk of cardiovascular disease than its individual components. Insomnia with objective short sleep duration (ISSD) has been associated with adverse cardiometabolic impact i.e., hypertension or diabetes. The aim of this study is to examine whether objective short sleep duration modifies the effect on clinical (hypertension) and preclinical inflammatory and metabolic biomarkers in patients with mild-to moderate OSA (mmOSA) and insomnia symptoms.
Methods: A clinical sample of 164 adults (52.76±13.08 years old) with mmOSA (5 ≤ AHI < 30) underwent polysomnography or home sleep testing, measures of blood pressure (BP), body mass index (BMI), fasting blood glucose, insulin, CRP and IL-6 plasma levels, and completed Epworth Sleepiness Scale (ESS) and Pittsburg Sleep Quality Index (PSQI). Presence of EDS was defined as ESS score ≥ 11. Insomnia symptoms were defined as a self-report of more than 3 nights/week over the past 4 weeks of at least one of the following symptoms in the PSQI: "Cannot get to sleep within 30 minutes" or "Wake up in the middle of the night or early morning". Objective short sleep duration was defined as < 6.8-hours sleep based on the median total sleep time. Participants were classified into 4 clinically meaningful groups: asymptomatic mmOSA (control group), mmOSA with EDS, mmOSA with insomnia symptoms and objective short sleep duration (COMISA-SSD) and mmOSA with insomnia symptoms and objective normal sleep duration (COMISA-NSD). Univariate general linear models were conducted controlling for age, gender and BMI.

Results: Mean average systolic and diastolic BP were elevated in COMISA-SSD group compared to COMISA-NSD group (p=.042, p=.055, respectively). Plasma lnCRP and lnIL-6 concentrations were significantly elevated in COMISA-SSD group compared to control group (p=.010, p=0.014 respectively). Also, lnHOMA and insulin resistance (lnGlucose/insulin ratio) were significantly increased in COMISA-SSD group compared to COMISA-NSD group (p=.031, p=.046, respectively).
Conclusion: These findings show that the additive adverse cardiometabolic effects of COMISA phenotype are primarily driven by the insomnia short sleep duration phenotype, which appears to respond better to medication than psychological interventions.
Support (if any):

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0371

THE ODDS RATIO PRODUCT: A NOVEL TOOL TO IDENTIFY FEATURES OF COMORBID INSOMNIA AND SLEEP APNEA

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Introduction: Many patients presenting with either OSA or insomnia symptoms exhibit signs of the other condition. This overlap, known as COMISA, is often undetected due to differing diagnostic methods: PSG for OSA and clinical symptoms for insomnia. The lack of objective diagnostic criteria for COMISA contributes to its low diagnosis rate. We sought to address this gap by investigating whether the Odds Ratio Product (ORP) algorithm can accurately distinguish between individuals with COMISA, OSA patients, and controls.
Methods: 2000 patients (50% male/female) were selected from a large clinical cohort, equally grouped into 5 categories of 400 patients: clinic controls (AHI < 5, no insomnia), mild OSA (AHI 5-15), mild OSA and insomnia (defined by presence of self-reported complaints of difficulty initiating sleep, maintaining sleep, experiencing restless sleep, and daytime fatigue), moderate-severe OSA (AHI ≥ 15, ODI ≥ 15), and moderate-severe OSA and insomnia. The OSA and COMISA subgroups were matched by AHI. The ORP was computed using a 3-second sliding window, averaged across each 30-second epoch of PSG total recording time (TRT). Extracted ORP features included mean, minimum, and percent TRT spent in ORP deciles 1-10 (1=deepest sleep; 10=fully awake). Univariate ordinal regression was utilized to classify disease subgroups using each ORP feature as input.
Results: Each disease subgroup was compared to clinic controls (reference group) and statistically presented in the following rank-ordered format (mild OSA, mild COMISA, moderate-severe OSA, moderate-severe COMISA). Significant discriminatory ORP features for disease subtype were mean ORP in NREM (ORs: 3.51, 9.35, 17.3, 43.8, $p < 0.001$), minimum ORP (ORs: 5.67, 6.33, 5.62, 12.3, $p < 0.001$), and percent TRT spent in decile 2 “deep sleep” (ORs: 0.982, 0.969, 0.963, 0.947, $p < 0.01$) and 7 “transitional sleep” (ORs: 1.05, 1.08, 1.09, 1.11, $p < 0.01$).
Conclusion: This study demonstrates the potential utility of the ORP algorithm to identify and discriminate between OSA and COMISA subgroups, the latter being underdiagnosed and inadequately treated in the routine sleep clinic paradigm. These findings suggest that ORP may be a valuable tool in the polysomnographic assessment of comorbid sleep disorders, offering a pathway towards an objective assessment and targeted treatment strategies.
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0372

QUETIAPINE EFFECT ON SLEEP, BREATHING, AND NEXT DAY PERFORMANCE IN PEOPLE WITH OSA AND DIFFICULTY MAINTAINING SLEEP

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Introduction: Quetiapine is commonly prescribed "off-label" to people with insomnia symptoms. People with undiagnosed obstructive sleep apnea (OSA) frequently report insomnia symptoms, particularly difficulties in maintaining sleep. In 2020, 10.6 million prescriptions were dispensed for quetiapine in the United States. Yet, there is limited information regarding the effects of quetiapine on breathing, sleep, and next-day performance in people with OSA.
Methods: We performed a double-blind, randomized, placebo-controlled, cross-over study (NCT05303935) in 15 people with OSA who also reported difficulty maintaining sleep. Participants were studied overnight via polysomnography on two separate occasions ~1 week apart and received either 50mg of quetiapine or a placebo (order randomised) just prior to sleep. 10-minute psychomotor vigilance and 30-minute AusEd driving simulator tests were performed each morning.
Results: Participant demographics: 7 women, 8 men, ([Mean±SD] age 61 ± 10 years, BMI 28 ± 4 kg/m2). Quetiapine reduced the apnea/hypopnea index (primary outcome) versus placebo (20±12 vs. 27±16 events/h, p=0.02), arousal index (25±9 vs. 32±16 arousals/h, p=0.02), and increased sleep efficiency (87±9 vs. 80±11, p< 0.01) without worsening hypoxemia (e.g., mean overnight SpO2 94.5±1.5 vs. 94.7±1.2 %, p=0.42). However, next morning vigilance (e.g., median reaction time 382±84 vs. 336±48ms, p=0.02) and driving simulator performance (e.g., steering deviation 95±54 vs. 73±39, p=0.02) were impaired with quetiapine versus placebo.
Conclusion: Consistent with a hypnotic effect, a single night low dose of quetiapine reduces OSA severity as measured via the apnea/hypopnea index and increases sleep efficiency without worsening overnight hypoxemia. However, there is evidence of next day impairment in vigilance and driving simulator performance
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0373

MODERATING FACTORS IN THE RELATIONSHIP BETWEEN INSOMNIA AND ALCOHOL USE

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Introduction: Insomnia and Alcohol Use Disorder are highly comorbid and share a bidirectional relationship. However, little research has examined which factors contribute to this alarming relationship. Contributing factors may include circadian preference (specifically eveningness), depression symptom severity,

and global stress levels. Here, we used cross-sectional baseline data from two randomized control trials of an online CBT-I treatment program in samples of heavy drinkers with insomnia in order to elucidate whether these factors moderate the relationship between drinking behaviors and sleep.
Methods: Heavy drinking men and women with insomnia (n = 238) completed measures of drinking behaviors (Alcohol Use Disorder Identification Test), insomnia severity (Insomnia Severity Index), circadian preference (Composite Morningness Scale), depression (CESD-R), and global stress (Perceived Stress Scale) during the baseline phase of an online insomnia treatment study. Baseline data from two randomized control trials were pooled together for these analyses. Hierarchical linear regressions were used to examine the interactive effects of circadian preference, depression, and stress on the relationship between insomnia and drinking behaviors. Significant interactions were probed using bootstrapped estimates of simple slopes.
Results: Evening preference was associated with higher ISI scores (p = .02), and a trend level association with higher AUDIT scores (p = .07). However, no significant interactive effect was found between CSM and ISI scores on the AUDIT (p = .86). In contrast, significant interactions were found between the CESDR and ISI (p = .02) and PSS and ISI (p = .02) on the AUDIT. Specifically, there was a positive relationship between the ISI and AUDIT for those with either high or moderate CESDR or PSS scores (ps ≤ .05) but not for those with low CESDR or PSS scores (ps ≥ .77).
Conclusion: These findings suggest that the relationship between insomnia and drinking behaviors are strong among those with high to moderate levels of depression or stress but not among those with low levels. In contrast, circadian preference does not appear to impact the relationship between insomnia and drinking behaviors. Future longitudinal and treatment studies should further investigate the role of depression and stress on this problematic relationship.
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0374

DIMENSIONS OF SLEEP HEALTH AND MOOD DISORDERS IN MIDDLE EASTERN/NORTH AFRICAN WOMEN

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Introduction: Insomnia symptoms are a common sleep disturbance during midlife. However, emerging evidence suggests that midlife women also experience increased risk of obstructive sleep apnea and short sleep duration. Cohorts of women in midlife have mostly included white women, despite suspected sleep health disparities among women from underrepresented racial and ethnic backgrounds. To address this gap, we conducted a pilot study that examined sleep health among women from Middle Eastern/North African (MENA) ancestry.
Methods: This pilot study enrolled 77 women aged 40-60y from MENA ancestry, recruited mostly from Michigan. Women provided demographic, lifestyle, sleep and health information through interviews with structured and validated questionnaires, including the Pittsburgh Sleep Quality Index (PSQI) and Patient Health Questionnaire (PHQ-9). Risk for obstructive sleep apnea (OSA) was evaluated using the STOP questionnaire+BMI and a subset of the women was tested with Watch-PAT, a one-night home sleep apnea testing device (OSA diagnosis, apnea-hypopnea index pAHI3%>5/h). The menopause rating scale was used to collect data on psychological and physiological symptoms.
Results: Mean age of women was 48y±5 years and mean BMI was 27.6±5 kg/cm2. Anxiety, irritability, and depression symptoms were identified in 33%, 25% and 31% of women. Half reported trouble falling asleep within 30 minutes, and 73% experienced nocturnal and early morning awakenings three or more times per week. Most women (75%) were aware of adequate sleep recommendations, but 54% reported short sleep duration, < 6 hours, and 30% reported < 5 hours of sleep per night. A STOP+BMI score ≥3 was observed in 20% of women. Twenty women were tested for OSA and 75% had it (mean pAHI3%=12.6/h). Moderate and severe OSA was apparent among 20% and 10% of the 20 women. Concurrent OSA and insomnia symptoms were observed among 40% of women. The odds ratio of insomnia were 9-fold and 3-fold for women with depression and anxiety, respectively.
Conclusion: We found a high burden of poor sleep and sleep disorders among midlife women from MENA ancestry. Moreover, poor sleep was associated with symptoms of depression and anxiety, raising the possibility that efforts to improve sleep health could benefit the mental health of these women as well.
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0375

PREDICTORS OF INSOMNIA AND DEPRESSION IN A RANDOMIZED CONTROLLED INSOMNIA TREATMENT TRIAL IN THE COVID-19 PANDEMIC

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Introduction: The COVID-19 Pandemic resulted in increases in insomnia risk factors, including elevated sleep reactivity, perceived stress, loneliness, and screen time. Here, we test whether these factors predicted worse subsequent insomnia and depression symptoms as part of a randomized controlled feasibility trial of a brief insomnia intervention early in the pandemic.
Methods: Forty-nine participants with acute pandemic-onset insomnia symptoms were randomized to receive telehealth Cognitive Behavioral Therapy for Insomnia (CBT-I) over five weeks or to a waitlist control. Participants completed baseline measures of sleep reactivity, perceived stress, loneliness, and screen time. Outcome measures included the Insomnia Severity Index and the Patient Health Questionnaire-9 (minus the sleep item) collected at 12 and 28 weeks. As described in the protocol paper, two likelihood ratio tests (one for insomnia and one for depression) were used to test the hypothesis that the risk factors collectively contribute to subsequent insomnia and depression. Specifically, for each outcome, likelihood ratio tests compared a linear mixed effect model containing the 4-baseline risk factor measures and treatment arm as predictors against a model containing only treatment arm. Considering our joint hypothesis test does not address the significance of individual risk factors, we tested whether each risk factor was predictive in isolation

using post-hoc mixed effects models (one for each risk factor across insomnia and depression while still controlling for treatment arm). Benjamini-Hochberg adjustment for multiple comparisons was used across the 8 post-hoc models.
Results: Collectively, the insomnia risk factors did not predict subsequent insomnia or depression (p's>0.25, marginal ΔR2's< 0.518) above what would be predicted by receiving CBT-I or waitlist control. However, when considered in individual models, perceived stress and loneliness were significant predictors of both outcomes (b's>0.22, adjusted-p's< 0.012) above and beyond treatment arm. Screen time and sleep reactivity were not significant predictors of either outcome (b's< 0.13, adjusted-p's>0.149).
Conclusion: Although this study was conducted in a relatively small sample, these results suggest that increased loneliness and perceived stress may be associated with worse insomnia and depressive symptoms several months later. Thus, loneliness and perceived stress may represent early intervention targets during periods of acute stress and disruption, like the COVID-19 pandemic.
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0376

THE HYPERAROUSAL SUBTYPE OF INSOMNIA DISORDER IS ASSOCIATED WITH DEPRESSIVE SYMPTOMS

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Introduction: Both the hyperarousal state and depressive symptoms are associated with insomnia disorder (ID). However, it is unknown whether the characteristics of hyperarousal and depressive symptoms vary across ID subtypes.
Methods: This study (NCT05985512) included 136 participants aged 18 to 65, diagnosed with ID by DSM-5 criteria. We employed psychological assessments of depression using Hamilton Depression Rating Scale (HAMD-17) and one-night polysomnography (PSG) to collect psychological and electroencephalographic (EEG) characteristics including macro sleep structures and spectral features including peak frequency (frequency of the local maximum peak of mean power). Uniform Manifold Approximation and Projection (UMAP) and Variational Bayesian Gaussian Mixture Model (VB-GMM) were applied for data dimensionality reduction and cluster analysis. Dunn's test were conducted to compare depressive and EEG features across subtypes. Significance was set at P< 0.05.
Results: VB-GMM clustering identified three subtypes of ID: (i) Light Sleep Subtype: This group exhibited moderate HAMD-17 scores and the least amount of N3 sleep (Dunn's test p < 0.001). (ii) Least Depression Subtype: Participants reported the lowest levels of depression and had the most N3 sleep (Dunn's test p < 0.05) with the lowest alpha and beta EEG peak frequencies during NREM sleep (Dunn's test p < 0.05). (iii) Hyperarousal with Depression Subtype: This subtype had the highest level of depressive symptoms (HAMD-17 scores, Dunn's test p < 0.001). Although the third subtype's N3 sleep was more than that in Subtype 1 (Dunn's test p < 0.001), the higher alpha and beta EEG peak frequencies (Dunn's test p < 0.05) during NREM sleep suggested a state of hyperarousal.
Conclusion: The subtype of ID with the highest level of depressive symptoms is associated with cortical hyperarousal. Future research is needed to study the causal relationship between insomnia and depression under the hyperarousal model.
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0377

ASSOCIATIONS OF EVENING-TYPE AND INSOMNIA SYMPTOMS WITH DEPRESSIVE SYMPTOMS AMONG ADOLESCENTS AND YOUNG ADULTS

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Introduction: Evening-type and insomnia symptoms are closely related to each other and independently associated with depressive symptoms, yet few studies have examined the potential interaction between these two conditions. Therefore, we aimed to examine the associations of evening-type and insomnia symptoms with depressive symptoms among Chinese young people, with a specific focus on the joint effects of the two conditions on depressive symptoms.
Methods: Participants aged between 12 to 25 were invited to participate in an online survey from December 15, 2022, to May 26, 2023. The reduced Morningness and Eveningness Questionnaire, Insomnia Severity Index, and Patient Health Questionnaire-9 were used to evaluate chronotypes, insomnia and depressive symptoms, respectively. Multivariate logistic regression models were used to examine the independent associations of chronotypes and insomnia symptoms with depressive symptoms, while additive interaction models were used to further explore the joint effects of chronotypes and insomnia symptoms on depressive symptoms.
Results: Of the 6145 eligible participants, the prevalence of evening-type and insomnia symptoms were 24.9% and 29.6%, respectively. Both evening-type (adjusted odds ratio [AdjOR]: 3.62, 95% CI: 3.19-4.11) and insomnia symptoms (AdjOR: 11.75, 95% CI: 10.26-13.47) were associated with an increased risk of depressive symptoms. In addition, the additive interaction models showed that there is an enhanced risk of depression related to interaction between evening-type and insomnia symptoms (relative excess risk of interaction [RERI]: 12.39, 95% CI: 3.62-21.17). In the subgroup analyses for adolescents (RERI: 10.37, 95% CI: 5.44-15.30) and young adults (RERI: 15.48, 95% CI: 5.49-25.46), positive interactions between evening-type and insomnia symptoms on depressive symptoms remained.
Conclusion: The present study provided additional evidence demonstrating the independent and joint contributions of evening-type and insomnia symptoms to depressive symptoms among young people. In particular, there is an interaction effect of evening-type and insomnia symptoms, further increasing the

risk of depressive symptoms. Our findings argue the need for addressing both sleep and circadian factors in the management of depressive symptoms in young people.
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0378

IMPROVEMENTS IN PRENATAL INSOMNIA PREDICT LOWER DEPRESSION SEVERITY DURING POSTPARTUM IN LOW- AND HIGH-INCOME WOMEN

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Introduction: Low socioeconomic status increases the risk of prenatal and postpartum depression. Additionally, women of low-income status are disproportionately impacted by insomnia and poor sleep during pregnancy, which could contribute to poorer mental and physical health. Treating insomnia during pregnancy has the potential to reduce the risk of postpartum depression. We examined whether after accounting for baseline and psychosocial risk of depression, improvements in prenatal insomnia predicted lower postpartum depression in low- and high-income women.
Methods: We selected low- (< $55,000/year; n=35) and high-income (≥$100,000/year; n=59) participants drawn from a randomized, multi-site, controlled trial of CBT-I for perinatal insomnia. The study excluded women with depressive disorders. Treatments consisted of five sessions during pregnancy and one at 6 weeks postpartum. Participants completed the Insomnia Severity Index (ISI), Edinburgh Postpartum Depression Scale (EPDS), and Perinatal Risk Questionnaire (PRQ) at baseline. ISI and EPDS were additionally completed 8 weeks after randomization and at 8, 18, and 30 weeks postpartum. Separate generalized estimating equation models were conducted for each group. Women were included if they completed at least one postpartum assessment.
Results: After accounting for baseline ISI, a 1-unit reduction in ISI at post-treatment was associated with a reduction of .18 units in the average postpartum EPDS scores among participants in the low-income group (p=.048) and .21 units among the high-income group (p=.008). Baseline EPDS was a significant predictor of the average postpartum EDPS in the low-income group, such that a 1-unit increase in baseline EPDS increased postpartum EPDS by .32 units (p=.015), but was not a predictor in the high-income group. Baseline ISI and PRQ and time were not significant predictors (ps>.05).
Conclusion: Predictors of postpartum depression severity were different for low- and high-income pregnant women with insomnia. We found that the effect of treating prenatal insomnia on reducing postpartum depressive symptom severity was stronger for high- versus low-income women and that baseline depression symptoms predicted postpartum depression symptoms among low- but not high-income women. The results suggest that to optimally reduce postpartum depressive symptoms among low-income women, treatment will need to address additional risk factors beyond insomnia.
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0379

TADEIC-UNAM: SCREENING SCALE TO IDENTIFY INSOMNIA, DEPRESSION AND ANXIETY AMONG SLEEP CLINIC PATIENTS IN MEXICO

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Introduction: Insomnia is among the most prevalent symptoms in patients evaluated for sleep disorders. When chronic, it is frequently associated with Depression and Anxiety. This study assessed the "Tamizaje de Ansiedad, Depresión e Insomnio Crónico" (TADEIC) as a screening scale to evaluate insomnia and possible comorbid depression and anxiety.
Methods: Two hundred thirty-three patients with chronic insomnia completed the TADEIC at the UNAM Sleep Disorders Clinic (age: 50.3±15.7; females: n=132 [56.7%]). The internal consistency was evaluated with Cronbach's Alpha, and structural equation modeling was computed to conduct a confirmatory factor analysis (CFA). Convergent validity was assessed with Beck's anxiety and depression inventories (BAI, BDI). The scales were completed at the time of initial consultation.
Results: CFA revealed four factors with moderate model fit: "Insomnia (two items), "Anxiety" (five items), "Dysthymia" (three items), and "Melancholy" (three items). After two adjustments, seven of the initial twenty items were discarded to support a good model fit. The model was assessed with the Comparative Fit Index of 1.683, Standardized Root-Mean-Square Residual (SRMR).044, Root-Mean-Square Error of Approximation (RMSEA)=.035. The internal consistency was high (α= .859). Anxiety intercorrelations with insomnia, dysthymia, and melancholy were moderate to high (r=.44-.65*, p<.001), insomnia intercorrelations with dysthymia and melancholy and were low to moderate (r=.27-.45, p<.01), Dysthymia and Melancholy intercorrelations were moderate (r=.55, p<.001). Convergent validity of the anxiety factor was moderate with the BAI (r=.587, p<.01) and moderate (.4-.64, p<.01) for the melancholy and dysthymia factors with the BDI.
Conclusion: The TADEIC showed adequate internal reliability and external validity. It consists of four dimensions that allow clinicians to identify insomnia, anxiety dysthymia, and melancholy. The availability of such a screening tool will facilitate identifying psychiatric morbidity among patients with chronic insomnia.
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0380

FATIGUE, ANXIETY AND HEAVY MENSTRUAL FLOW INTERFERE IN SEVERE INSOMNIA SYMPTOMS OF WOMEN AT REPRODUCTIVE AGE

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Introduction: Insomnia is the most prevalent sleep disorder worldwide, and women have a greater risk of developing insomnia symptoms than men. The high prevalence of insomnia

in women may be due to the hormonal oscillations that occur across the entire course of a woman's life during the reproductive age. Our aim was to investigate the association between insomnia severity symptoms and menstrual health, fatigue and anxiety symptoms in women at reproductive age.
Methods: We used data from the EPISONO database (2007) with a sample of 282 women. Women completed the Insomnia Severity Index (ISI), the Chalder Fatigue Scale (CFS) and the Beck Anxiety Inventory (BAI) to obtain information about insomnia, fatigue and anxiety symptoms. For menstrual health, we collected information using our institutional women's questionnaire about menstrual flow and duration, the presence of pain during menstruation and menstrual cycle regularity. The statistical analysis was performed using multinomial logistic regression, considering p< 0.05.
Results: Our results demonstrated that fatigue and anxiety symptoms were statistically correlated with mild, moderate and severe insomnia symptoms (OR=1.43; 95%CI=1.02-1.99; p=0.034; OR=1.10; 95%CI=1.02-1.20; p=0.014, respectively). Heavy menstrual flow was statistically associated with severe insomnia symptoms (OR=13.8; 95%CI=1.58-121.9; p=0.018). Menstrual cycle regularity, pain during menstruation and menstrual duration were not statistically related to insomnia symptoms.
Conclusion: Our data showed that heavy menstrual flow increased the likelihood of having severe insomnia symptoms, while fatigue and anxiety symptoms contributed to the odds of having mild, moderate or severe insomnia symptoms. Menstrual health is an important subject that needs to be further explored by the scientific community in order to provide practices and treatments that can improve women's sleep and quality of life.
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0381

CONSTRUCT VALIDATION OF THE PERINATAL RUMINATION SCALE AT NIGHT IN PREGNANT PATIENTS SEEKING INSOMNIA TREATMENT

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Introduction: Perseverating on perinatal concerns at night (nocturnal perinatal rumination) increases insomnia, depression, and suicidal ideation (SI) during pregnancy. Poorly sleeping pregnant women identify reducing nocturnal perinatal rumination as critical for alleviating insomnia during pregnancy. However, no validated measures of nocturnal perinatal rumination exist, thereby limiting research in this area. We sought to develop and validate a brief survey to assess nocturnal perinatal rumination.
Methods: This study was a cross-sectional analysis of 223 pregnant women seeking insomnia treatment. Our team developed 11 questions to create the Perinatal Rumination Scale-Night (PRS-Night). Participants rated how intensely they experienced intrusive thoughts related to pregnancy while trying to sleep at night. Responses ranged from 0=not at all to 5=extremely (item examples: worry about your pregnancy or baby; have thoughts or concerns about childbirth). We conducted an exploratory factor analysis (EFA) with varimax rotation to identify the number of latent variables in our measure. Finally, we evaluated the measure's internal consistency, convergent validity, and discriminant validity.
Results: 159 patients (71.3%) screened positive for clinical insomnia (insomnia severity index [ISI]≥11), 88 patients (39.5%) screened positive for PND (Edinburgh postnatal depression scale [EPDS]≥10), and 161 patients (72.2%) screened positive for high cognitive arousal (pre-sleep arousal scale's cognitive factor [PSASC]≥18). Bartlett's test of sphericity was significant (p<.001) and KMO was >.90, supporting EFA. The scree plot revealed one factor (Eigenvalue=6.10) consisting of all 11 items. Internal consistency was excellent (Cronbach's α=.92). The PRS-Night yielded good convergent validity with the PSASC (r=.56, p<.001), ISI (r=.53, p<.001), EPDS (r=.58, p<.001), and perinatal anxiety questionnaire-revised (r=.54, p<.001). SI rates were elevated for pregnant patients with high rumination (PRS-Night median-split high vs low: 19.6% vs 9.5%). The PRS-Night yielded good discriminant validity with the Epworth sleepiness scale (r=.13, ns) and patient-rated chronotype (r=.10, ns).
Conclusion: This study supports the psychometric validity of the PRS-Night for assessing nocturnal perinatal rumination. Given patient stakeholder interest in perinatal rumination at night, the PRS-Night has immense potential to help researchers better understand disease processes related to perinatal rumination and evaluate this construct as an important target mechanism in prenatal insomnia care.
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0382

THE NEURAL ACTIVATION INVOLVED IN THE EMOTIONAL INTERFERENCE OF COGNITIVE CONTROL IN INSOMNIA DISORDER

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Introduction: This study investigated the altered neural activation underlying emotional interference and its role in linking sleep disturbance in insomnia disorder.
Methods: Thirty-four insomnia patients (female 73.53%, mean age 50.76±11.98 years) and 33 controls (female 63.64%, mean age 42.73±11.90) were included in this study. They completed self-reported questionnaires (Pittsburgh Sleep Quality Index (PSQI), Insomnia Severity Index (ISI), Epworth Sleepiness Scale (ESS), and Dysfunctional Beliefs and Attitudes about Sleep (DBAS)) to assess subjective sleep quality, sleepiness and faulty sleep-related cognition. The sleep diary was used as a tool for the evaluation of subjective sleep parameters, whereas actigraphy and polysomnography were employed to assess objective sleep parameters. Depressive/anxiety symptoms were assessed using Beck Depressive inventory and Beck Anxiety inventory, respectively. All participants performed the emotional Stroop task in two blocks (negative emotional and neutral words) during functional magnetic resonance imaging (fMRI) assessments. We compared brain activation during the emotional Stroop between two group. Also, we analyzed correlations between altered neural

activation and sleep/ emotion-related variables which show a difference between two groups.
Results: When performing the emotional Stroop task with negative emotional words, insomnia patients showed lower neural activation in the right occipital (MNI coordinates = 30,-88,-10; cluster size= 275; p=0.001) and right superior temporal (MNI coordinates =42,-28, 8; cluster size=174; p=0.007) area compared to controls. These decrease neural activations during negative emotional words were negatively correlated with the levels of subjective sleep quality and faulty sleep-related cognition (right occipital area: PSQI CE= -0.38, FDR corrected p=0.002; ISI CE= -0.32, FDR corrected p=0.032; DBAS CE= -0.39, FDR corrected p=0.009, right superior temporal area: PSQI CE= -0.34, FDR corrected p=0.030; DBAS CE= -0.45, FDR corrected p=0.002, respectively)
Conclusion: In insomnia patients, there may be a diminished capacity to perceive negative emotional stimuli and cognitive control under emotional interference associated with decreased activity of the right occipital and right superior temporal areas. This tendency is associated with subjective sleep disturbance and faulty sleep-related cognition.
Support (if any): This study was supported by National Research Foundation (NRF) of Korea (Study no. NRF-2018R1D1A1B07049704 and no. NRF-2022R1A2C1008209).

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0383

COMMON PATHWAYS BETWEEN DISTRESS AND IMPAIRMENT RELATED TO INSOMNIA, PAIN, AND STRESS

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Introduction: Insomnia, chronic pain, and stress are highly comorbid, contributing to significant distress and impairment. Research on measures of insomnia, such as the Insomnia Severity Index, have revealed a two-factor structure consisting of both severity of insomnia symptoms and perceived distress and impairment. Prior research suggests that this perceived distress and impairment factor may represent a cognitive vulnerability that may impact other domains, including experiences of pain and stress. Pain catastrophizing, "a negative cognitive–affective response to anticipated or actual pain" and sleep reactivity, a trait-like degree to which stress exposure disrupts sleep, are both constructs that tap into similar elements of perceived distress and impairment. This study aimed to examine associations between perceived distress and impairment from insomnia, pain catastrophizing, pain interference, and sleep reactivity.
Methods: Participants from an online database were asked to complete the Insomnia Severity Index (ISI), Pain Catastrophizing Scale, McGill Pain Questionnaire, PROMIS Pain Interference Questionnaire, and the Ford Insomnia Response to Stress Test. Participants (n =398) were predominantly female (79%) and White (74%). The ISI was analyzed as two separate factors (i.e., F1 or the insomnia symptoms factor = items 1-3 and F2 or the insomnia-related impairment factor = items 4-7).
Results: Multiple adjusted regressions revealed that perceived insomnia distress and impairment (i.e., F2) was significantly related to pain catastrophizing ($t = 2.18$, $p = .03$) and pain interference ($t = 3.55$, $p < .001$), independent of insomnia and pain severity. Sleep reactivity was also significantly related to pain catastrophizing ($t = 3.71$, $p > .001$), even after adjusting for insomnia and pain severity.
Conclusion: Results suggest that the perceived distress and impairment resulting from insomnia, pain, and stressful events may represent a transdiagnostic vulnerability. Future research is needed to determine whether this pattern of distress and impairment extends to objective measures, such as actigraphy. This pattern of perceived distress and impairment could represent a viable intervention target.
Support (if any):

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0384

MULTICOMPONENT BEHAVIORAL SLEEP INTERVENTION FOR INSOMNIA IN OLDER ADULTS WITH MILD COGNITIVE IMPAIRMENT

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Introduction: Insomnia is prevalent in older adults with mild cognitive impairment. Current treatment options are limited due to the nature of cognitive impairment and a paucity of providers. We sought to determine the preliminary effects of a multicomponent behavioral sleep intervention (MBSI) compared to a sleep education control condition on sleep latency, wake after sleep onset, total sleep time and efficiency.
Methods: Participants were enrolled and randomized in a 1:1 ratio to intervention or control in this pilot randomized controlled trial. Inclusion criteria were: self-reported and diary based evidence of insomnia (latency ≥ 30 minutes or wake after sleep onset ≥ 60 minutes) and Modified Telephone Interview for Cognitive Status scores between 28-36. The intervention was delivered virtually via tablet and consisted of sleep hygiene education, meaningful activity in the daytime and relaxation therapy in the evening for 4 weeks. The active control received sleep hygiene education only. Data collection occurred at baseline and immediately post intervention. Sleep variables were averaged over one week at each time point from daily sleep diaries. We used non-parametric Kruskal-Wallis tests to compare intervention and control post-intervention.
Results: We screened 180 potential participants and enrolled 27 older adults with mild cognitive impairment. Our sample was balanced on all key variables, had a mean age of 65.63 ± 6.39, was primarily (81.5%) female, and mixed between white (51.9%), Black (44.4%). Retention rate was high at almost 90%. At baseline, average latency was 46.5 (27.3) minutes for control and 41.4 (33.10) for intervention group. Post intervention, average latency for control group was 47.0 (34.6) and 28.3 (31.8) for intervention (p=0.076) Standardized mean difference (SMD) was 0.56. Average efficiency for control group was 65% (11%) and 70% (12%) for intervention at baseline. Post intervention, efficiency was 68% (14%) for control group and 78% (12%) for intervention (p=0.044). SMD was 0.76. There were no significant differences between groups for wake after sleep onset or total sleep time.
Conclusion: Preliminary evidence supports testing MBSI on a larger scale to improve insomnia symptoms in older adults with mild cognitive impairment and to determine if these effects are sustained over time.

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0385

HYPNOSIS INTERVENTION FOR SLEEP DISTURBANCES IN INDIVIDUALS WITH MILD COGNITIVE IMPAIRMENT

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Introduction: Poor sleep quality is highly prevalent among individuals with mild cognitive impairment (MCI). Further, poor sleep quality is associated with reduced quality of life, increased stress response, memory impairments, and progression to dementia among individuals with MCI. Pharmacological treatments for sleep have mixed efficacy and can lead to dependency. Therefore, alternatives to pharmacological treatments for improving sleep among individuals with MCI are needed. The present study reports on the feasibility of a non-pharmacological. It was hypothesized that the hypnosis intervention program would be feasible and have acceptable levels of adherence to daily hypnosis practice.
Methods: A two-armed randomized controlled pilot trial was conducted using a sample of 21 adults with MCI. Eligible participants were randomly assigned to listen to either hypnosis audio recordings or sham hypnosis recordings for five weeks. Program feasibility, program adherence, pain intensity, stress, and sleep quality were measured using a daily home practice log, questionnaires, and wrist actigraphy.
Results: The results found mid or higher levels of treatment satisfaction, ease of use, and perceived effectiveness at one-week follow-up, with participants in the hypnosis arm reporting greater perceived benefit. Adherence to assigned audio recordings and meetings were likewise within acceptable margins in both groups. No intervention-related adverse events were reported in either treatment condition. Significant improvements in sleep quality, sleep duration, and daytime sleepiness were found for the hypnosis intervention.
Conclusion: The results of this study can be used to inform future research on the effects of hypnosis on sleep quality in adults with MCI.
Support (if any):

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0386

FEASIBILITY OF A HYPNOSIS INTERVENTION FOR SLEEP QUALITY IN CAREGIVERS OF INDIVIDUALS WITH ALZHEIMER'S DISEASE

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Introduction: Poor sleep quality is a common health issue in caregivers of adults with Alzheimer's Disease and Related Dementias (ADRD). Nonpharmacological treatment options such as hypnosis have been proposed for improving sleep in this population since pharmacological measures can impair their ability to wake up readily to provide care. The present study aimed to determine the feasibility of a hypnosis intervention program for improving sleep quality in caregivers of individuals with ADRD.
Methods: A sample of 21 eligible adults were randomly assigned to either a self-administered hypnosis or a sham hypnosis group.
Results: The findings indicated feasibility of accrual, randomization, and intervention delivery. The mean satisfaction rating scores were 8.75 (SD = 1.28) and 7.50 (SD = 1.77) in the treatment and control groups, respectively, on a 0-to-10 numerical rating scale (0 = highly dissatisfied, 10 = highly satisfied). The mean ease of use rating was 8.50 (SD = .93) in the treatment condition and 8.75 (SD = 1.39) in the control condition. There was good adherence to actigraphy and self-report measures of sleep duration and sleep quality. Although the study was not powered for efficacy testing, trends indicated significant improvements in sleep quality ($t(4) = 3.500$, $p = .025$, $d = 1.57$) and sleep duration ($t(4) = -4.648$, $p = .010$, $d = 2.08$) for the hypnosis intervention.
Conclusion: These findings are encouraging and indicate a need for a fully powered randomized clinical trial for efficacy testing.
Support (if any):

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0387

SLEEP-SMART FOR VETERANS WITH MILD COGNITIVE IMPAIRMENT (MCI) AND INSOMNIA: A PILOT STUDY

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Introduction: Mild cognitive impairment (MCI) is an important public health concern for aging Veterans as it is a known risk factor for progression to dementia. Insomnia is common in MCI occurring in up to 60% of patients. Cognitive Behavioral Therapy for Insomnia (CBT-I) is the recommended treatment for insomnia, however, cognitive impairments experienced by individuals with MCI may limit the ability of some individuals to adequately understand and actively participate in CBT-I. In this study a modified CBT-I treatment Sleep-SMART (Sleep Symptom Management and Rehabilitation Therapy) was developed and pilot tested with Veteran input. Sleep-SMART incorporates supportive cognitive strategies into a CBT-I protocol to enhance CBT-I learning and adherence.
Methods: 14 Veterans completed the 6-week Sleep-SMART intervention. Each participant was assessed on the Insomnia Severity Index (ISI) and the Pittsburgh Quality Sleep Index (PSQI) at pre- and post-treatment (Weeks 0 and 6 respectively). Veterans also completed weekly sleep diaries for the duration of the 6-weeks of treatment. Independent t-tests were performed comparing pre and post-treatment scores for the ISI, PSQI, and sleep diary variables (sleep efficiency [SE], total sleep time [TST], sleep latency [SL], wake after sleep onset [WASO], and early morning awakening [EMA]). Treatment acceptability was examined using the average rating on the Acceptability of Intervention Measure (AIM; 1–5-point Likert type scale, with higher scores indicating greater acceptability).
Results: Participants (11M/3F, age=71.8+/-6.9yrs) showed significant symptom improvement on both ISI (pre=18.25/post=10.83,$p<.001$) and PSQI (pre=11/post=8.73,$p=.034$) total scores. This improvement was further illustrated in the sleep diary measures which showed significant improvement

across all metrics: SE (pre=70%/post=89%,p<.001), TST (pre=5.40hrs/post=6.49hrs,p=.007), WASO (pre=50.53mins/post=20.73mins,p<.001), and EMA (pre=61.29mins/post=15.16mins,p=.003). Importantly, the Sleep-SMART treatment protocol was viewed as acceptable to Veterans (AIM; M=4.46,SD= 0.62).
Conclusion: The Sleep-SMART intervention was viewed as acceptable and produced significant improvements in insomnia symptoms. These findings suggest that Sleep-SMART has the potential to be an effective modified form of CBT-I treatment that is uniquely tailored to aging Veterans with cognitive challenges. Future randomized controlled trials are warranted to investigate the efficacy of Sleep-SMART more broadly.
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0388

LEMBOREXANT EFFECT ON SLEEP PARAMETERS IN ADULTS WITH MODERATE OR SEVERE CHRONIC OBSTRUCTIVE PULMONARY DISEASE

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Introduction: Several commonly prescribed hypnotics may worsen respiratory function, especially in the elderly. Lemborexant (LEM) is a competitive dual-orexin-receptor-antagonist approved to treat adults with insomnia. In Study E2006-A001-113 (NCT04647383), LEM demonstrated respiratory safety in participants with untreated moderate-to-severe chronic obstructive pulmonary disease (COPD). This post hoc analysis evaluated sleep variables from this study.
Methods: This double-blind, placebo (PBO)-controlled, crossover study enrolled adults (45–90y) with untreated moderate or severe COPD, assessed by Global Initiative for Obstructive Lung Disease spirometry recommendations (apnea hypopnea index < 15 was allowed). Participants were randomized to LEM 10mg (LEM10) or PBO in two 8-night treatment periods (separated by ≥14d). Latency to persistent sleep (LPS), sleep efficiency, wake after sleep onset (WASO), and total-sleep-time (TST) were assessed using in-laboratory polysomnography on Days 1 (D1) and 8 (D8).
Results: The analysis set comprised 30 adults with moderate (n=25) or severe (n=5) COPD (mean [SD] age, 69.2 [6.3]y; 70.0% female). Six (20%) participants had a medical history of insomnia. Least squares mean (LSM; standard error [SE]) LPS was significantly shorter (improved) with LEM10 compared with PBO on D1 (LEM10, 30.9 [9.0] min; PBO, 51.5 [9.0] min; P< 0.01) and D8 (LEM10, 27.0 [7.0] min; PBO, 46.6 [7.0] min; P< 0.001). LSM (SE) sleep efficiency was significantly higher (improved) with LEM10 compared with PBO on D1 (LEM10, 81.0% [2.6%]; PBO, 66.6% [2.6%]; P< 0.0001) and D8 (LEM10, 77.1% [2.9%]; PBO, 69.4% [2.9%]; P< 0.0001). LSM (SE) WASO was significantly lower (improved) with LEM10 compared with PBO on D1 (LEM10, 68.2 [9.6] min; PBO, 114.6 [9.6] min; P< 0.0001) and D8 (LEM10, 90.4 [9.9] min; PBO, 106.1 [9.9] min; P< 0.0001). LSM (SE) TST was significantly longer (improved) with LEM10 compared with PBO on D1 (LEM10, 388.9 [12.4] min; PBO, 319.5 [12.4] min; P< 0.0001) and D8 (LEM10, 370.1 [13.7] min; PBO, 332.9 [13.7] min; P< 0.0001). LEM was well-tolerated.
Conclusion: In participants with untreated moderate-to-severe COPD, most of whom did not have a medical history of insomnia, LEM improved sleep onset, sleep maintenance, and TST compared with PBO, suggesting LEM may be a potential treatment option for patients with COPD and insomnia.
Support (if any): Eisai, Inc.

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0389

A COMPUTERIZED COGNITIVE BEHAVIORAL THERAPY RANDOMIZED, CONTROLLED, PILOT TRIAL FOR INSOMNIA IN EPILEPSY

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Introduction: Insomnia is the most common sleep-wake complaint in adults with epilepsy (AWE), impacting quality of life and potentially seizure control. Cognitive behavioral therapy for insomnia (CBTI) is the first-line treatment, although often costly and inaccessible. We conducted a Pilot Trial using web-based CBTI for Insomnia in AWE.
Methods: This randomized controlled trial was conducted at Cleveland Clinic comparing the efficacy of web-based CBTI Go to Sleep (GTS) to controls who received an informational sheet on sleep hygiene. The primary outcome was a change in the Insomnia Severity Index (ISI). Fatigue Severity Scale (FSS), Epworth Sleepiness Scale (ESS), Patient Health Questionnaire-9 (PHQ-9), and self-reported total sleep time (TST) were also evaluated. GTS adherence was measured by % of modules (total of 6) completed. Change in survey scores was assessed using ANOVA tests with Pearson's correlations between baseline and 8 weeks post-randomization.
Results: A total of 35 subjects (GTS: N=18; control: N=17) were included; mean age 40.9±10.9, 77.1% female, ISI 21.6±3.4, FSS 46.3±9.5, ESS 9.6±5.9, PHQ-9 12.8±5.2, TST 6.1±1.8 hr. At baseline, all patients had ISI of 15+. At follow-up, 33.3% of GTS and 47.1% of controls had scores of 15+(p=0.88). ISI change was greater in GTS than in controls (-9.0 (-11.3,-6.6) vs. -5.8 (-8.4,-3.3); p=0.079). Changes in other patient-reported outcomes (PROs) and TST between groups were not significant. However, decreases in ISI were associated with decreases in ESS, p=0.004 and PHQ-9, p< 0.001, but not FSS or TST. Eleven (61.1%) of GTS patients completed the 6-module program. 75% reported satisfaction with the audio components and content of the program and found GTS very easy to use. Completion of lessons was associated with a decrease in FSS, p=0.031.
Conclusion: Comparable improvement in insomnia symptoms and other PROs were observed in AWE engaging in web-based CBTI and sleep hygiene education. Program adherence was good. Despite sample size limitations, these findings support the role of non-pharmacological insomnia treatment in AWE.
Support (if any):

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0390

EFFICACY OF SUVOREXANT FOR INSOMNIA DISORDER IN WELL-CONTROLLED RESTLESS LEGS SYNDROME

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Introduction: Sleep disturbance remains common in patients with a history of Restless Legs Syndrome (RLS), even after RLS symptoms are sufficiently controlled with medication. Multiple potential causes for treatment-refractory sleep disturbance exist, including conditioned insomnia and poor sleep habits due to chronic RLS-related sleep disturbance, and comorbid medical and psychiatric illness. We conducted a placebo-controlled crossover trial to examine the efficacy of suvorexant in improving sleep quality and quantity in patients with well-controlled RLS and persistent insomnia.
Methods: In this double-blind, randomized, placebo-controlled crossover trial, 34 patients with well-controlled RLS were randomized to placebo or suvorexant (10-20 mg) for 6 weeks, followed by a 2-week washout and then the opposite treatment. Well-controlled RLS was defined as a score of less than 15 on the International Restless Legs Syndrome Study Group Rating Scale (IRLS) and Insomnia Disorder was defined by a self-reported combined Sleep Onset Latency (SOL) and Wake After Sleep Onset (WASO) of greater than 45 minutes and a Total Sleep Time (TST) of less than 7 hours. The primary outcome was actigraphically-derived TST, and secondary outcomes were Insomnia Severity Index (ISI) score and actigraphically-derived WASO. Data for all sleep metrics were collected at baseline and for the last two weeks of each treatment period.
Results: There were no significant improvements in actigraphically-derived TST ($p = 0.58$) or WASO ($p = 0.99$) while taking suvorexant compared to placebo. However, there was a significant reduction in insomnia symptoms, measured by the ISI, while taking suvorexant ($p = 0.03$). Moreover, exploratory analyses revealed a significant increase in self-reported TST ($p = 0.01$) and a significant reduction in nightly variability in TST ($p = 0.03$) while taking suvorexant. The most commonly reported side effect of suvorexant was fatigue (29.4%).
Conclusion: Though we did not observe a significant change between treatments in our primary endpoint of actigraphically-derived TST, our secondary and exploratory findings revealed promising support for suvorexant's positive impact on self-reported quantity and quality of sleep in people with well-controlled RLS who continue to suffer from insomnia.
Support (if any): Funded by an investigator-initiated grant from Merck Pharmaceuticals.

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0391

EFFECTS OF BRIEF BEHAVIORAL TREATMENT FOR INSOMNIA ON INSOMNIA AND SLEEP QUALITY IN CANCER SURVIVORS

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Introduction: Insomnia is prevalent in more than 50% of cancer survivors, occurring during and after their treatment trajectory, potentially leading to subsequent insomnia disorder. Brief Behavioral Treatment for Insomnia (BBTI) aims to assist cancer survivors to self-manage their behaviors to improve their sleep to reduce insomnia symptom burden. This study determined efficacy of BBTI versus a healthy eating program attention control on insomnia severity index (ISI) and sleep quality measures overtime, in a heterogeneous sample of cancer survivors.
Methods: A sample of 132 eligible cancer survivors were recruited and randomized into BBTI (experimental) and control groups. All participants completed baseline demographics and sleep-related surveys (e.g., ISI, Pittsburgh Sleep Quality Index [PSQI]) at: baseline, 1-month, 3-month, and 12-month post intervention. Statistical analysis of ISI and sleep quality at each time point proceeded using fitted ANCOVA models with independent variables including randomized treatment assignment, participant cancer type, the interaction between treatment assignment and cancer type, and baseline outcome level. Tests for treatment effect were performed using an exact permutation testing approach with a two-sided 0.05 nominal significance level.
Results: Statistically significant group differences (p-values < 0.05) were observed at all time points for both ISI and sleep quality. Mean differences (95% CI) in ISI (BBTI minus control) were estimated to be -2.2(-4.1, 0.4), -2.1(-4.2, 0.1), and -2.3(-4.4, 0.1) at 1-, 3-, and 12-months, respectively. For sleep quality, the estimated mean differences were -1.4(-2.6, 0.2), -1.8(-3.0, 0.5), and -1.8(-3.3, 0.3), respectively. When adjusting for covariates known to be predictive of outcome, ISI results were robust, with treatment group difference remaining statistically significant except for when adjusting for treatment related surgery where results became borderline non-significant.
Conclusion: BBTI was significantly effective in reducing insomnia severity and improving sleep quality overtime compared to control among cancer survivors with insomnia symptoms. Use of BBTI in cancer survivors can help bridge the gap in addressing insomnia symptoms in survivorship settings.
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0392

INSOMNIA WITH SHORT SLEEP DURATION IS ASSOCIATED WITH HEART DISEASE AND STROKE: EVIDENCE FROM THE UK BIOBANK COHORT

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Introduction: Evidence on the association of insomnia short sleep duration phenotype (ISSD) with heart disease and cerebrovascular disease (CBVD) is limited and based on cohorts using polysomnography. The aim of this study is to assess the risk of ISSD with incident heart disease and CBVD including stroke in the large UK biobank cohort based on self-reported insomnia and objectively measured habitual sleep duration by accelerometer.
Methods: We identified 96219 participants from the UK Biobank who underwent a 1-week objective sleep measure during 2013-2016. Short sleep duration was defined as ≤ 7.3 hours/night (i.e., median), after excluding participants who slept ≤ 3 hours/night or ≥11 hours/night. Self-reported insomnia symptoms obtained

± 1-year within the objective sleep measure, which was available from 4156 participants, was used to define insomnia status. Participants reported "Usually" having insomnia symptoms (vs. Never/Rarely/Sometimes) were categorized as having insomnia. Four sleep phenotypes based on the presence of short sleep duration (Yes/No) and/or insomnia symptoms (Yes/No) were created. Major confounding factors, including age, sex, BMI, smoking, and alcohol intake, were extracted from the study visit closest to the objective sleep measure. To evaluate the associations between the sleep phenotypes with incident heart and CBVD, multivariable-adjusted Cox proportional hazards models were used. The effective sample sizes for analysis on heart and cerebrovascular diseases were 3630 and 4064, respectively.
Results: Compared to normal sleepers with normal sleep duration, only ISSD phenotype was associated with significant risk for heart disease (HR=1.77, 95%CI=1.25-2.49, P=0.001) whereas neither the insomnia normal sleep duration group nor the normal sleepers short sleep duration group were associated with increased risk for heart disease. Similarly, compared to normal sleepers with normal sleep duration, only the ISSD group was associated with increased risk for CBVD including stroke (HR=2.18, 95%CI=1.21-3.92, P=0.009) whereas there was no association between the other two sleep groups and CBVD.
Conclusion: These data from the large UK biobank database using an ecologically friendly method to assess habitual objective sleep duration suggest that it is the combination of insomnia plus short sleep duration (ISSD), that increase significantly the risk for heart disease and stroke.
Support (if any):

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0393

INSOMNIA WITH SHORT SLEEP DURATION IS ASSOCIATED WITH HYPERTENSION AND ENDOTHELIAL DYSFUNCTION IN YOUNG ADULTS

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Introduction: Prior studies have examined the association between insomnia with short sleep duration (ISSD) with hypertension in middle-aged adults. However, no study to date has examined its association with elevated blood pressure (eBP) and flow-mediated dilation (FMD) in young adults.
Methods: We studied 270 young adults (median 25y, 53% female, 24% racial/ethnic minority) from the Penn State Child Cohort who underwent a 9-hour polysomnography (PSG) recording and Doppler ultrasound to asses FMD. The average of three consecutive BP readings was used to calculate resting mean arterial pressure (MAP) in the evening and morning. eBP was defined as systolic BP ≥120 mmHg, diastolic BP ≥80 mmHg, hypertension diagnosis, and/or antihypertensive medication use. Insomnia symptoms were defined as difficulties initiating or maintaining sleep, insomnia diagnosis or complaint, and/or sleep medication use. PSG-measured short sleep duration was defined by the median of the sample (i.e., < 7-h), identifying normal sleep duration (NSD), short sleep duration (SSD), insomnia with normal sleep duration (INSD) and ISSD. Multivariate general linear models tested mean differences in MAP and FMD across the four groups adjusting for sex, race/ethnicity, age, waist circumference, sleep apnea, cardiometabolic disorders, substance and medication use. A logistic regression model examined the association of the four groups with the presence of eBP, while accounting for the same covariables.
Results: Compared to NSD (84.6±1.2) or INSD (85.7±0.8), ISSD showed significantly higher evening MAP levels (88.0±0.8; p=0.022 and p=0.044, respectively), a finding replicated by morning MAP levels. Neither INSD (p=0.466) nor SSD (86.9±1.3; p=0.190) showed significantly elevated MAP levels compared to NSD. Similarly, ISSD (9.4±0.5; p=0.012), but not INSD (10.3±0.5; p=0.170) or SSD (10.3±0.7; p=0.257), showed significantly lower FMD levels compared to NSD (11.4±0.6). The odds of eBP were significantly increased in ISSD (OR=2.5, 95%CI=1.0-6.2; p=0.044), but not in INSD (OR=1.7, 95%CI=0.7-4.3; p=0.244) or SSD (OR=1.4, 95%CI=0.5-4.1; p=0.580), compared to NSD.
Conclusion: ISSD, but not INSD, is associated with hypertension and endothelial dysfunction in young adults. Clinical trials should examine whether improving insomnia symptoms and lengthening objective sleep duration in this phenotype may lead to favorable cardiovascular outcomes.
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0394

THE CANNABIDIOL USE FOR RELIEF OF SHORT-TERM INSOMNIA (CAN-REST). A RANDOMISED PLACEBO-CONTROLLED CLINICAL TRIAL

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Introduction: Cannabidiol (CBD) is a non-intoxicating cannabinoid which Australian regulators (TGA) have proposed down-scheduling to an over-the-counter pharmacist-only medicine pending positive efficacy trials. This trial compared the effect of 50mg and 100mg/day of an oral capsule CBD medicine with placebo over 8 weeks on insomnia symptoms, stress and mood.
Methods: This was a sponsor-initiated (NCT05253417) randomised, double-blind, 3-arm parallel superiority trial. This study was undertaken remotely without in-person visits. Participants were randomised (1:1:1) via a centralised computerised secure system. Potential participants were recruited through social and other media advertising with all participants initially directed to an online screening platform. Those who met initial eligibility were invited to a telehealth screening and informed consent visit. Inclusion criteria included adults aged 18-65 years with an Insomnia Severity Index (ISI) of 8-21. All questionnaires were collected through the online platform, and we couriered actigraphy devices and blinded study drug to participants. Safety blood and urinary drug screening was performed before and after treatment by local pathology services. The primary outcome was ISI and secondary outcomes were actigraphy-derived wake after sleep onset, stress and anxiety (DASS-21 questionnaire). The critical p-value for the primary hypotheses was < 0.025 and < 0.0083 for any of the 3 secondary outcomes to maintain an overall false discovery rate of 5% in each of the primary and secondary comparisons.

Results: Recruitment was ceased (n=206) when we reached our pre-defined sample size (50mg=64; 100mg=62; placebo=80; 146 females; mean age 47 years [19-65]; ISI=16.8 [8-21]). All participants were analysed under the intention-to-treat principle. At 8-week follow-up there was no difference between placebo and 100mg (-1.3, 95%CI [-2.8 to 0.3], p=0.10) or 50 mg (0.1, [-1.4 to 1.6], p=0.89) on the ISI. No secondary outcomes were positively affected (all p≥0.04). All adverse events were minor and consistent with the known pattern of events for CBD.
Conclusion: There was no significant effect of 8 weeks of a low-dose CBD medicine on insomnia symptoms in intention-to-treat analyses. It is possible that higher doses of CBD and identifying insomnia subgroups responsive to CBD may be effective and are warranted for future research.
Support (if any): BOD Science, Australia

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0395

EFFECTIVENESS OF A DIGITAL CLINICAL DECISION SUPPORT PLATFORM TO AUGMENT CBTI CAPABILITY GAPS IN THE DHA/DOD

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Introduction: Insomnia is the most prevalent sleep disorder among active duty service members (ADSMs) and compromises readiness. Cognitive-behavioral therapy for insomnia (CBTI) is the DoD/VA recommended treatment, but access and delivery of CBTI is impeded by gaps between high patient demand for care and clinical capabilities. We evaluated the effectiveness of a digital clinical decision support (CDS) platform to overcome current CBTI capability gaps.
Methods: Mental healthcare providers (MHCPs) at military clinics were offered access to a novel CDS platform (COAST, NOCTEM® Health, Inc) to treat patients they deemed appropriate for this CBTI delivery mode. The platform consists of (1) clinician portal to remotely monitor and manage patients' symptoms, progress, and adherence to algorithm-based, MHCP-approved treatment recommendations; (2) patient app that prospectively collects sleep diaries and displays MHCP-approved treatment recommendations (e.g., stimulus control, sleep restriction). The primary outcomes were treatment response (50% reduction in sleep latency (SL) or wake after sleep onset (WASO); increase of > 10% in sleep efficiency (SE)) and insomnia remission (response & SL & WASO < 30 minutes with SE > 85%) at the end of treatment. The magnitude of changes in diary-based SL, WASO, and %SE were compared from baseline and at the final intervention was quantified using Cohen's d effect sizes.
Results: Nineteen MHCPs at 7 Air Force Bases, 2 Naval hospitals, and 1 Army medical center utilized the platform with 245 ADSMs presenting with insomnia (M age =32.6 + 8.0 y.o.; 27.3% women, 78% Sailors/Marines, 19% Airmen, 3% Soldiers). Average treatment duration was 5 ±1 weeks. The mean completion rate of diaries was 77% + 20%. Post-treatment, 83.5% of ADSMs met treatment response criteria, and 70.3% met remission criteria. From baseline to the last intervention, clinically meaningful improvements in SL, WASO, and %SE were observed (all Cohen's d > .5).
Conclusion: Augmentation of CBTI capabilities among MHCP using a digital CDS platform is feasible and yields rapid and clinically meaningful improvements in sleep among ADSMs with insomnia. CDS-enabled services may facilitate the scalability of DoD/VA insomnia management practices and reduce CBTI capability gaps.
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0396

INTENSIVE SLEEP RETRAINING AND SLEEP DEPRIVATION FOR TREATING CHRONIC INSOMNIA: A RANDOMIZED CONTROLLED TRIAL

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Introduction: Intensive sleep retraining (ISR) is a promising alternative treatment option for individuals who do not respond to standard cognitive behavioral therapy for insomnia. ISR capitalizes on two potential modes of actions: 1) a reconditioning between the bed and bedroom with rapid sleep onset and 2) an increase in the homeostatic sleep drive due to sleep deprivation. The present study compares the efficacy of ISR with total sleep deprivation for the treatment of chronic insomnia.
Methods: 34 adults (10 males, 24 females, mean age 33.8 years) with chronic sleep-onset insomnia (with or without sleep maintenance difficulties) were randomized to ISR, total sleep deprivation (TSD) or a control (CTL) condition. The ISR treatment consisted of 42 sleep onset trials over a 21-hour sleep deprivation period, the TSD treatment consisted of an equivalent 21-hour sleep deprivation without sleep onset trials, and the CTL condition consisted of one night of habitual sleep in the laboratory. Participants completed several measures including the Insomnia Severity Index (ISI) and daily sleep diaries at pre-treatment, post-treatment, and at 1, 2, and 3 months after treatment.
Results: From pre-treatment to 3-month follow-up, significant and large decreases in insomnia severity were observed in both ISR (M = -5.91 units, p < .001, d = -1.99) and TSD (-5.41 units, p < .001, d = -1.82). Mean pre-treatment ISI scores (16.3) were in the moderate severity range and fell into the subthreshold insomnia category at post-treatment for both ISR (M = 12.4) and TSD (M = 12.6) groups and remained in that range at follow-up. From the same pre-treatment to 3-month follow-up period, a significant and moderate reduction in sleep onset latency was observed for the ISR group (M = -11.66 min, p < .05, d = -0.76), but not for the other two groups.
Conclusion: Both ISR and TSD were effective in reducing insomnia symptoms severity, but ISR produced a superior treatment response on sleep onset latency and this improvement was generally maintained up to 3 months after treatment.
Support (if any): This research was supported by a grant from the Canadian Institutes of Health Research (#148410).

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0397

RANDOMIZED CONTROLLED TRIAL OF TELEHEALTH IN OLDER ADULTS: TECHNOLOGY-ASSISTED CBTI+, CBTI, AND SLEEP HYGIENE

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Introduction: Of 34M US adults affected by insomnia, 75% are older adults. Cognitive Behavioral Therapy for Insomnia (CBTi) is recommended because polypharmacy and fall risks accompany pharmacotherapies. We evaluated telehealth CBTi with an interactive patient-therapist application, SleepSpace, which integrates data from wearables and Internet of Things (IoT) devices.
Methods: This RCT (NCT05015803) followed community-dwelling participants 60-90 years old with an Insomnia Severity Index (ISI) score ≥11. Absence of mild cognitive impairment was affirmed with the Montreal Cognitive Assessment (MoCA) Blind v.8 (score ≥ 18). Participants wore actigraphy and an Apple Watch throughout and independently completed a weekly electronic ISI. They attended 7 weekly, ~1hr video-conference sessions (1 intake, 6 procedural) with a clinical therapist. Participants were randomly assigned to one of 3 study conditions (age-, gender-stratified): 1) education about sleep hygiene only (20%; "Hygiene"), 2) telehealth CBTi (40%; "CBTi"), and 3) telehealth CBTi with phone/IoT platform application enhancement (40%; "CBTi+") including meditations, sound machines, smart light bulbs, an electronic diary, with visualizations, metrics, and wearable data shared with participants in the CBTi+ condition. Linear mixed models compared ISI change across time by group.
Results: Of 60 individuals enrolled, 54 were randomized and retained (39F, mean±SD age=71±4y). ISI slopes for both CBTi (-.09/day) and CBTi+ (-.09/day) declined at a significantly steeper rate than Hygiene (-.05/day; each p<.05), but did not differ from one another. Significantly more CBTi+ participants exhibited full remission (ISI < 8; 18/21, 85.7%) than in the Hygiene group (5/11, 45.4%; p=.03 Fisher's Exact); CBTi alone (16/22, 72.7%) did not significantly differ from Hygiene, although with limited statistical power. Diary-reported sleep measures to calculate self-reported sleep efficiency (sSE) in the final week at end of treatment revealed differences in mean±SD for Hygiene (81±05%) vs. CBTI (88±07%), and vs. CBTI+ (90±04%, p< 0.05, t-test).
Conclusion: This research supports the efficacy of a remote, technology-assisted telehealth CBTi platform to improve insomnia symptoms comparable to standard telehealth-CBTi in older adults with insomnia. The platform provides enhanced data access for therapists and opportunities for data-driven engagement with patients.
Support (if any): R44 AG056250, UL1TR002014

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0398

IMPACT OF AN OVER-THE-COUNTER "SLEEP LOTION" ON SALIVARY MELATONIN LEVELS AND SLEEP QUALITY

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Introduction: Many over-the-counter products such as bubble baths, room sprays, and lotions claim they contain the pineal hormone melatonin and promote sleep. In this randomized, controlled, double-blind crossover trial we compared the impact of a commercial "sleep lotion" versus a placebo control lotion.
Methods: Participants applied lotions on two different nights, one hour before bedtime. To assess whether melatonin was absorbed through the skin and circulating systemically, we conducted enzyme linked immunosorbent assays on saliva samples to quantitate melatonin levels. We also assessed sleep quality the night after lotion application with a modified Pittsburgh Sleep Quality Index. The amount of melatonin in Dr. Teal's Sleep Lotion was measured using High Performance Liquid Chromatography.
Results: Our sample of 63 undergraduate college students scored an average of 6.3 ± 2.7 on the Global Pittsburgh Sleep Quality Index, with 65% above the cutoff of 5 indicating poor sleep quality in the previous 30 days. The melatonin-containing sleep lotion dramatically impacted salivary melatonin levels, increasing them up to ~1000 fold compared to the placebo control lotion. Sleep quality in the overall group was not impacted by the lotion, but in a subsample of the poor sleepers, the lotion improved sleep quality. High Performance Liquid Chromatography of the sleep lotion revealed the presence of 2.4 ± 0.1 mg melatonin/g lotion, or a 0.24 ± 0.01% formulation.
Conclusion: Caution should be taken by consumers using over-the-counter melatonin lotions because the undisclosed dosage is high and well absorbed by the skin. Clinicaltrials.gov ID NCT06053385
Support (if any):

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0399

MASKED TAPERING AND AUGMENTED CBTI IMPROVES BENZODIAZEPINE RECEPTOR AGONIST DISCONTINUATION IN A RANDOMIZED TRIAL

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Introduction: Benzodiazepines and benzodiazepine receptor agonists (BZRAs) are not recommended as first-line therapy for insomnia in older adults due to adverse events (e.g., falls). Although guidelines recommend cognitive behavioral therapy for insomnia (CBTI) and BZRA discontinuation, discontinuing BZRAs is challenging. To improve discontinuation success, we developed and tested a novel intervention (grounded in the science of known placebo effects of BZRAs), masked taper plus

cognitive behavioral therapy-augmented program (MTcap), which masks the daily BZRA dose during tapering and adds novel cognitive and behavioral exercises targeting placebo effects to CBTI. We hypothesized that MTcap would increase BZRA discontinuation 1 week (PTX) and 6 months post-treatment (6M) compared to standard CBTI plus supervised (unmasked) gradual taper (SGT).
Methods: In a multi-site randomized trial, adults (>= 55 years) who use lorazepam, alprazolam, clonazepam, temazepam, and/or zolpidem at doses <= 8 mg diazepam-equivalent 2+ nights/week for >= 3 months for insomnia were randomized to MTcap versus SGT. Blinded research staff conducted PTX and 6M assessments including one-week medication logs and Insomnia Severity Index (ISI). Effects of MTcap versus SGT on BZRA discontinuation (primary outcome) were modeled with logistic regression. Using two-level mixed-effects models, we predicted additional outcomes (frequency [#days/week taken], dose, ISI) as a function of treatment group, site, treatment-site interaction, and time.
Results: 188 participants (mean age 69.2 years, 34.6% female, mean frequency 5.9 days/week BZRA use, mean diazepam-equivalent 3.9 mg, mean ISI 14.0) were randomized (MTcap n=92, SGT n=96), with PTX and 6M follow-up rates of 94.7% and 93.6%, respectively. BZRA discontinuation for MTcap was superior to SGT at both PTX (MTcap=0.884, SGT=0.674; odds ratio [OR] 3.683, 95% CI 1.670, 8.122, p=.001) and 6M (MTcap=0.734, SGT=0.586; OR 1.955, 95% CI 1.033, 3.700, p=.039). Change in BZRA frequency was lower in MTcap than SGT at PTX (-1.32, 95% CI -2.07, -0.57, p<.001), but not 6M. ISI did not differ between these two active treatment groups at PTX or 6M.
Conclusion: Adding a masked taper and novel cognitive and behavioral exercises targeting placebo effects to traditional unmasked tapering plus CBTI results in markedly improved long-term BZRA discontinuation, with similar improvement in symptoms of insomnia.
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0400

COMPARING THE EFFECTIVENESS OF CANNABIS TO TREAT SLEEP IMPAIRMENTS BETWEEN THOSE WITH AND WITHOUT SLEEP DISORDERS

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Introduction: People are increasingly turning to cannabis to treat sleep disorders and symptoms. Despite mixed results in prior research, there is a small body of research indicating that cannabis could have a positive impact on sleep disorders, as well as people who have sleep issues that haven't arisen to a clinical level warranting diagnosis. It's important to understand if there are differences in the effectiveness of these therapies between those who have a sleep disorder diagnosis versus those who do not.
Methods: Using an online cross-sectional survey, individuals across Pennsylvania self-reported how they used cannabis to treat sleep disturbances (N=1034). Participants self-reported demographics, employment status and hours, sleep diagnoses, mental health diagnoses, cannabis use for sleep, symptoms of Cannabis Use Disorder using the Cannabis Use Disorder Identification Test Short Form (CUDIT-SF, range: 0-12), and their sleep disturbances using the Insomnia Severity Index (ISI, range: 0-28). To determine if a formal sleep diagnosis is associated with insomnia severity while using cannabis, a one-way ANCOVA was used to compare the difference between those with and without sleep diagnoses on the ISI on days that cannabis was used. Analyses controlled for age, gender, race, number of mental health diagnoses, cannabis use disorder, employment status, and job shifts that may negatively impact sleep.
Results: While using cannabis, both those with a diagnosis (M=9.56, SD=4.39) and without a diagnosis (M=8.56, SD=4.06) reported scores well below the clinical cutoff of 15 on the ISI. There was a significant effect of formal sleep disorders on ISI scores after controlling for stated covariates [F(1, 827)=6.69, p=.01]. While most participants used cannabis for sleep daily, a subset of the sample did not (n =222). Using a paired t-test, we compared if insomnia severity was significantly reduced on days when using cannabis compared to when not using. There was a significant increase in ISI scores on days that individuals did not use cannabis (M=13.43, SD=4.82) compared to days they used cannabis (M=8.76, SD=4.15), t(221)=14.85, p<.001.
Conclusion: While patients with formal sleep disorder diagnoses still report greater sleep issues, both groups showed significant improvement in their levels of impairment related to sleep while using cannabis.
Support (if any):

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0401

EFFECTS OF A 4-WEEK VINYASA YOGA INTERVENTION ON SLEEP AND CARDIOVASCULAR HEALTH IN ADULTS WITH INSOMNIA SYMPTOMS

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Introduction: Insomnia is associated with an increased risk for cardiovascular disease. Yoga may have the potential to improve both sleep and cardiovascular health. However, there is limited evidence of how vinyasa yoga (VY), a form of yoga that links breath with movement and exhibits a greater energy expenditure than most other styles, impacts sleep and cardiovascular function. The purpose was to examine the effects of a 4-week VY intervention on sleep and cardiovascular health in adults with insomnia symptoms.
Methods: 33 insufficiently active adults (84.8% female; 78.8% White; age=34.9±10.6 y; body mass index=28.9 kg/m2) with at least mild insomnia symptoms (Insomnia Severity Index [ISI]≥10) were randomized to a 4-week VY intervention (n=17) or non-active control (CON; n=16). VY practiced 3x/week following pre-recorded 60-minute videos and CON maintained their current lifestyle. Resting daytime measures of blood pressure, heart rate (HR) and heart rate variability (HRV) were obtained at baseline and post-intervention. Sleep was measured using the ISI, 7 nights of actigraphy, and a sleep diary. On one night during the sleep assessment, participants wore a chest HR monitor overnight to assess HRV. HRV was standardized for sleep duration, with root mean square of successive differences (RMSSD) the primary HRV outcome. Analyses compared changes in daytime cardiovascular health, sleep, and nocturnal

HRV from pre- to post-intervention between groups using linear mixed models and Cohen's d effect sizes.
Results: The change in ISI score from baseline to post-intervention did not differ between VY (15.18±0.96 to 9.93±1.00) and CON (16.63±0.98 to 13.87±0.98) (p=0.11) despite a medium-sized between-group effect size (d=-0.70) favoring VY. Among highly adherent participants, VY reduced ISI scores to a greater extent than CON (p=0.002). Changes in nocturnal RMSSD HRV and daytime resting cardiovascular measures were not statistically significant between groups (each p≥0.30). However, daytime resting HR decreased for VY (72.41±2.92 to 69.50±2.60 bpm) and increased for CON (70.47±2.54 to 72.93±2.60 bpm) (p=0.047).
Conclusion: Insomnia symptom reductions may be most apparent among those who consistently practice VY. VY had minimal impact on acute indications of cardiovascular health, suggesting changes may not occur with an intervention that is relatively short duration and/or low frequency.
Support (if any):

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0402

MEDIATING EFFECTS OF SOCIAL SUPPORT ON ASSOCIATIONS BETWEEN STRESS AND INSOMNIA

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Introduction: Insomnia is a common sleep disorder that is linked to environmental/social factors and medical illnesses. Insomnia is associated with stress, defined as the mental or emotional pressure experienced when an individual is faced with adverse or demanding circumstances that are perceived to or exceed their ability to cope. While stress can lead to insomnia, it is hypothesized that social support could affect the association between stress and insomnia. To understand this mechanism, the presented study examines the relationship between stress and insomnia among blacks, highlighting the role of social support in this demographic.
Methods: Black Participants (N=618; female= 65%, male= 35%), ages 18 and older, from 2 NIH-funded studies, ESSENTIAL and MOSAIC, provided sociodemographic data and completed questionnaires on behavioral and social determinants of sleep and health. Perceived stress, insomnia and social support were evaluated using the perceived stress scale, the insomnia severity index, and the multidimensional scale of perceived social support questionnaire, respectively. Descriptive and linear regression analyses were performed to explore the association between insomnia, stress, and social support. Mediation analysis was conducted to establish and understand the effect of social support on stress score and ISIScore. All analyses were performed using SPSS 29.
Results: Regression analysis revealed stress as the strongest predictor of insomnia in blacks [β= .227; p< .001]. The model adjusted for sex, age, and states (New York vs Florida). Perceived social support was significantly associated with a decrease in stress score and insomnia, [β= -.152; p<.001]. Mediation analysis revealed that the effect between Stress Score and ISIScore via the intermediary variable of Social Support is statistically significant (p=0.0005).
Conclusion: Stress is a robust predictor of insomnia among blacks. However, social support mediates this relationship by decreasing both stress and insomnia. Further research should investigate the importance of social support to promote better overall health and sleep.
Support (if any): NIH R01AG067523, R01HL142066, K01HL135452

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0403

SLEEP HEALTH AMONG UKRAINIANS: ONE YEAR AFTER RUSSIA'S FULL-SCALE INVASION

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Introduction: The study aims to investigate the prevalence of sleep disturbances, factors associated with sleep disturbances, and their impacts on quality of life among Ukrainian adults one year after Russia's full-scale invasion.
Methods: Online survey data were collected using a quota sampling approach. A total of 2364 adults living in Ukraine aged 18-79 years were recruited from 5 April 2023 to 15 May 2023. Short sleep duration was defined as sleep duration ≤ 6 hours, and long sleep duration was defined as sleep duration ≥ 9 hours. Insomnia was assessed by the Insomnia Symptom Questionnaire. The World Health Organization Quality of Life Brief Version was used to assess the quality of life.
Results: The prevalence of short sleep duration, long sleep duration, and insomnia among the overall population was 39.4%, 6.9%, and 38.5%. Additionally, females (short sleep duration: adjusted odds ratio (OR)=1.38; insomnia: adjusted OR=2.11) and those with depressive symptoms (short sleep duration: adjusted OR=1.51; insomnia: adjusted OR=5.86) were more likely to have both short sleep duration and insomnia. Individuals working in essential public service are more likely to have short sleep duration than those not working in essential public service (adjusted OR=1.50). Both short sleep duration and insomnia were associated with lower quality of life in the physical and psychological domains. Insomnia was also linked to lower quality of life in the social relationships domain.
Conclusion: Sleep health among Ukrainians during the war is concerning. More studies are warranted to understand the impacts of the war on sleep health.
Support (if any):

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0404

AMERICAS PREVALENCE OF INSOMNIA DISORDER IN ADULTS: ESTIMATION USING CURRENTLY AVAILABLE DATA

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Introduction: Insomnia disorder is a major clinical issue due to its high prevalence and negative health outcomes. While the prevalence of insomnia in developed countries like the United States and Canada is known, its prevalence across the broader Americas region (Northern America, Latin America and the Caribbean) remains unclear. Limited epidemiological studies have been conducted and the majority of the Americas' population does not have a reliable estimate for insomnia disorder. The purpose of this analysis was to estimate the Americas' prevalence of adult insomnia disorder using published data.
Methods: Published nation-specific estimates of the general population prevalence of insomnia disorder were applied to current population estimates for all countries in the Americas. We utilized the following criteria to determine which insomnia prevalence estimates to use: 1) studies that reported prevalence stratified by both age and sex together; 2) studies that reported prevalence by age and sex separately, we used the age-based results; 3) studies that reported prevalence by sex but not age; 4) studies that reported only a single prevalence estimate. Expert opinion was used to select the most methodologically rigorous study when >1 potential reference study existed for a nation. For countries lacking a reference study, we applied the estimates from a large, well-conducted study. Population estimates by sex and age (20yrs+) were sourced from the United Nations World Population Prospects 2022.
Results: There were 55 countries defined by the United Nations comprising the Americas of which 3 (5.5%) had a suitable prevalence estimate of insomnia. We estimated an Americas' adult insomnia disorder prevalence of approximately 123 million adults (16.8%), comprised of 73 million females (19.5%) and 50 million males (14.0%). The nations with the greatest burden of insomnia disorder are the United States (37 million), Brazil (29 million), and Mexico (16 million).
Conclusion: This large burden of disease, ~17% of adults, highlights the importance of comprehensive sleep health initiatives and the need for promotion of sleep health in public health policy. There is a lack of appropriate prevalence studies especially in low- and middle-income countries within the Americas.
Support (if any): Study funded by ResMed

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0405

PREVALENCE OF POOR SLEEP QUALITY AND ITS ASSOCIATION WITH SMARTPHONE USE IN SINGAPORE

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Introduction: Singapore, an urbanized multi-ethnic city-state in Southeast Asia with a very high smartphone penetrance, ranks among the most sleep deprived countries globally. This study examines the prevalence of poor sleep quality in Singapore and its association with smartphone use.
Methods: A cross-sectional household survey in eastern Singapore was conducted from October to December 2022. Subjects were included if they were residents aged 21 to 60 and own a smartphone. A simple random sampling design and a proportionate stratified approach by dwelling type was used to select 1200 households for the survey. Key variable data collected included sleep quality as measured using the Pittsburgh Sleep Quality Index (PSQI), problematic smartphone use (PSU) using the Smartphone Addiction Scale – Short Version, and smartphone usage patterns. Other variables included psychological symptoms of depression, anxiety, and stress using validated scales. Social support, sociodemographic, and lifestyle data were also recorded. Significant factors from bivariate analyses were included in adjusted multivariable logistic regression models.
Results: 400 participants (200 male, 200 female) were surveyed. Prevalence of poor sleep quality was 21%. PSU was associated with poor sleep quality (aOR 2.73, 95% CI 1.61 – 4.64, p< 0.001). Daily use of a smartphone in bed before sleep was associated with poorer sleep quality (aOR 2.70, 95% CI: 1.15 – 6.34, p=0.023), compared to no smartphone use. After lights out, even occasional smartphone use was associated with increased likelihood of having poor sleep quality (aOR 3.02, 95% CI: 1.31 – 6.95, p=0.010). Spending >4 hours compared to < 2h per day on the smartphone was also linked with poorer sleep quality (aOR 2.50, 95% CI: 1.15–5.43, p=0.020). Conversely, making smartphone calls to family (aOR 0.49, 95% CI: 0.25 – 0.96, p=0.040) or friends (aOR 0.39, 95% CI: 0.21 – 0.74, p=0.004) was negatively associated with poor sleep quality.
Conclusion: About a fifth of adults in Singapore suffer from poor sleep quality and it is significantly associated with smartphone usage patterns. It remains plausible that smartphone-mediated social connections could contribute to improved sleep quality; further research is required to explore this.
Support (if any): This research was supported by CGH's Joint Research and Innovation Grant (RIG202110-003PR).

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0406

DEMOGRAPHIC FACTORS ARE UNRELATED TO INTEREST IN VA BSM SERVICES: RESULTS OF A QUALITY IMPROVEMENT INITIATIVE

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Introduction: High rates of sleep disorders in Veterans increases demand for behavioral sleep medicine (BSM) services and clinical efficiency is essential to improving access to care. An ongoing quality improvement project assessing the utility of a clinic orientation group reduced intake no-show rates within a large Department of Veterans Affairs (VA) BSM clinic and revealed that some Veterans declined services after learning more about the treatment offerings. The goal of this analysis was to identify characteristics of patients following completion of the orientation group that predicted acceptance of BSM services to address potential disparities in engagement with BSM.
Methods: Data from 228 Veterans referred for BSM services were analyzed. Individuals were coded as interested (scheduling

or attending intake) vs. disinterested (declining or failing to attend intake) in BSM. Predictors included 1) race (0=white, 1=BIPOC), 2) Age, and 3) medical complexity based on VA disability rating and care assessment need (CAN) score (score predicting risk of hospitalization within the next year).
Results: Of the 228 Veterans reviewed, most patients were male (n =183, 84%) and identified as white (n=73; 32%), followed by Hispanic/Latinx (n=48, 21%), and Black (n=44, 19.3%) race/ethnicity. Average age was 51.4 years; SD=15.23, range [22,95]). A total of 73% (n=166) were interested in BSM services after the orientation group and 27% (n=62) were disinterested. Chi-square and logistic regression results indicated no differences between groups across predictors explored (p-values 0.34-0.80) when evaluated individually or in a multivariable model. No-show to intake appointments fell from 21% (n=74 out of 353 in the 11 months prior to initiation of the orientation group to 7.5% (17/267) after the orientation group was initiated.
Conclusion: Over one quarter of veterans referred to a BSM orientation group declined BSM services after learning more about services offered. Reduced intake no-shows suggests improved clinic efficiency. We did not identify differences in acceptance of services based on race/ethnicity, age, or medical complexity. Although the number of women in this sample was too small for statistical analysis, gender differences should be evaluated with a larger sample. Additional evaluations will consider whether disparities exist elsewhere in the referral pathway.
Support (if any): VAGLAHS GRECC

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0407

PHYSICIAN HEAL THYSELF – A NOVEL APPROACH TO IMPROVE SLEEP IN POST-GRADUATE MEDICAL TRAINEES

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Introduction: Post-graduate medical training entails long work hours, overnight shift work, nocturnal sleep disruptions and insufficient sleep. Mandatory work hour restrictions have had some benefits, but ongoing acute and chronic sleep deprivation in physician trainees continues to impair physical and mental health, impede work performance and contribute to patient safety concerns. Sleep deprivation is increasingly common regardless of profession, and most adults fail to get adequate sleep, in part due to worsening sleep hygiene. We sought to determine whether physician trainees might be similarly impacted by the plethora of contemporary, maladaptive lifestyle habits and behaviors that contribute to insomnia in the general population.
Methods: We recently developed and validated a comprehensive sleep hygiene survey (Atlantic Sleep Hygiene Questionnaire, ASHQ) consisting of 20 detrimental sleep habits based on a critical analysis of the sleep hygiene literature. The ASHQ was administered to 97 residents and fellows at 2 teaching institutions encompassing 13 different specialties. Trainees also completed a single item sleep quality assessment (Sleep Quality Score, SQS) and a screening tool for insomnia (Insomnia Severity Index, ISI). ASHQ scores were summarized and compared to SQS and ISI survey results, and correlations were analyzed for each assessment. Trainees were provided immediate feedback following completion of the survey.
Results: ASHQ and ISI scores were elevated in a majority of the trainees, indicating a high prevalence of detrimental sleep habits and insomnia, respectively. ASHQ scores were significantly associated with SQS and ISI scores, and there was a direct correlation between poor sleep hygiene, worse sleep quality and insomnia.
Conclusion: Detrimental sleep habits were highly prevalent in this cohort of post-graduate medical trainees, and poor sleep hygiene correlated with both subjective sleep quality and insomnia. ASHQ may be a useful instrument to identify and improve poor sleep hygiene in this already sleep-deprived population.
Support (if any):

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0408

PREDICTORS OF RESPONDERS IN SLEEP HYGIENE EDUCATION: A SECONDARY ANALYSIS OF RANDOMIZED CONTROLLED TRIALS

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Introduction: Few studies have investigated the predictors of the treatment response after attending sleep hygiene education (SHE). We aimed to explore the patient characteristics associated with a response to SHE for insomnia.
Methods: A secondary analysis was conducted to pool the data of two randomized controlled trials for insomnia (Trial registration number ClinicalTrials.gov: #NCT04227587; NCT03623438), in which the subjects in the comparison group had attended two 2-hour sessions (total 4 hours) of small-group based SHE. We examined the association of sociodemographic variables, clinical characteristics, baseline sleep-wake variables, and Sleep Hygiene Practice Scale (SHPS) items to the treatment response. Subjects with a reduction in insomnia severity index (ISI) scores of ≥ 6 points from baseline to week 8 were classified as responders. Factors were compared between responders and non-responders and by univariate and multivariate logistic regression analysis.
Results: A total of 170 subjects with insomnia disorder who had received the SHE program were included and 42 (24.7%) of them were classified as responders. At 8 weeks after baseline, the subjects showed a 2.88 points reduction in ISI total score, 11.5 minutes reduction in sleep onset latency, 10.4 minutes reduction in wake-time after sleep onset, 20.3 minutes increase in total sleep time, and 4.42% increase in sleep efficiency. Univariate logistic regression analysis has identified 12 potential predictors for SHE responders, including age, gender, baseline sleep parameters, and SHPS items. In the multivariate logistic regression analysis, age, ever tried exercise for improving sleep, and baseline ISI score remained significant predictors of SHE treatment response (age, adjusted OR 0.88, 95%CI 0.79, 0.97, p = 0.011; ever tried exercise for improving sleep, adjusted OR 11.0, 95%CI 1.16, 104.9, p = 0.037; baseline ISI score, adjusted OR 1.59, 95%CI 1.15, 2.19, p = 0.005).
Conclusion: Lower age, higher baseline ISI score, and ever-tried exercise for improving sleep were shown to predict the response of SHE. Our findings inform individuals who have insomnia to select the treatment for chronic insomnia in the future.
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0409

THE IMPACT OF FRAGRANCE ON THE QUALITY OF SLEEP

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Introduction: The utilization of scents in sleep medicine is gaining increased attention due to their demonstrated ability to enhance sleep quality. This study employed a randomized double-blinded crossover trial to investigate the effects of continuous nightly exposure to a synthetic jasmine scent, combined with lavender oil and passionflower herb, on both subjective and objective measures of sleep quality. With a focus on individuals characterized by delayed sleep onset and frequent disturbances, this research aimed to assess the potential benefits of aromatherapy in addressing sleep-related issues.
Methods: Thirty sensitive sleepers, falling within the Insomnia Severity Index (ISI) range of 7-14 and experiencing 2-3 sleep disturbances per week, participated in the study. The experiment was conducted over four nights in a sleep laboratory, with the initial night serving as an acclimation (baseline) period. The subsequent nights involved randomized exposure to different conditions: a placebo rose scent, a high-dose of jasmine scent, or a low-dose relative to essential oils. Participants were monitored, and standardized questionnaires were administered in both morning and evening sessions. The scent application, specifically on T-shirts, was assessed for tolerance.
Results: Comparisons to baseline revealed a significant improvement in both sleep quality and total sleep time when using scents. Notably, both high and low doses of jasmine demonstrated a reduction in wake after sleep onset. The application of scent on T-shirts was well-tolerated by all participants. These results collectively suggest a positive impact of jasmine scent on sleep parameters.
Conclusion: In conclusion, the findings of this study highlight the potential of aromatherapy, particularly the use of synthetic jasmine scent, in positively influencing sleep quality. The reduction in wake after sleep onset indicates a promising avenue for addressing sleep disturbances. Further exploration into factors such as dosage, application method, and duration of scent exposure is warranted to refine our understanding and optimize the therapeutic use of scents in sleep medicine.
Support (if any): This study received support from Marome GmbH, which supplied the scents.

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0410

DAILY SHIFTS IN SPIRITUAL AND SOCIAL CONNECTION ARE ASSOCIATED WITH NIGH-TO-NIGHT CHANGES IN SLEEP IN YOUNG ADULTS

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Introduction: Feeling connected, both spiritually and socially, contributes to positive health outcomes. In contrast, loneliness, the absence of social connection, is negatively associated with healthy sleep outcomes. Spiritual connection encompasses relationships with oneself, others, a higher power, or nature. The depth of these connections depends on self-awareness and soul-searching, shaping the level of intimacy but these internal feelings about personal spiritual connection are often overlooked.. This study examines the daily associations of feelings of spiritual and social connection with nightly sleep features in young adults (M=23+/-4 years of age).
Methods: This study included individuals with autism (n=33), social anxiety (n=28), and no diagnoses (n=33) Participants completed evening and morning diaries for 9 months while concurrently wearing an actigraph. The evening diary asked about daytime feelings of spiritual and social (digital and in-person) connection. Sleep diary measures included sleep onset latency, wake after sleep onset, total sleep time, and sleep efficiency. Multilevel linear modeling was used to explore daily/nightly associations between spiritual and social connection and sleep variables.
Results: Higher spiritual connection was associated with shorter sleep onset latency and (p=0.007) greater total sleep time (p=0.010), measured by sleep diary. Higher in-person social connection was associated with shorter total sleep time (p=0.010), measured by actigraphy. Higher digital social connection was associated with lower sleep efficiency (p=0.005), measured by actigraphy and lower self-reported wake after sleep onset (p=0.002). All other findings examining the daily/nightly associations between connection indexes and sleep variables were non-significant.
Conclusion: This study underscores the importance of considering internal spiritual connections alongside traditional measures of connection. As higher spiritual connection was associated with perceptions of sleep improvements (whereas in-person connection as associated with behavioral observations of sleep), spiritual connection could be a particularly salient intervention target for young adults with insomnia with sleep-state misperception. Digital social connection, however, revealed potential drawbacks, which highlights that even in the presence of connection using digital devices, electronic use may be deleterious to sleep.
Support (if any):

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0411

THE EFFECT OF NON-PHARMACOLOGICAL INTERVENTIONS FOR SLEEP DURING PREGNANCY: A SYSTEMATIC REVIEW AND META-ANALYSIS

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Introduction: Sleep problems are common during pregnancy. Maintaining good sleep is critical to maternal and fetal health. This systematic review and meta-analysis aimed to quantify the effective non-pharmacological interventions for sleep in the pregnant population.
Methods: This review was performed following PRISMA and registered in PROSPERO (CRD42022372289). Studies were identified from PubMed, CINAHL, Embase, Web of Science,

and Cochrane from inception to October 17, 2023 for intervention studies. Studies reporting non-pharmacological interventions and sleep-related outcomes were selected.
Results: Forty-two studies (N=3,378 women) were included. The efficacy of non-pharmacological interventions in terms of sleep quality showed a significant improvement (SMD=-1.17; 95% CI=-1.57 to -0.77; I2=97%; k=34). Interventions during the second trimester (SMD=-2.03; 95% CI=-3.26 to -0.79; I2=92%; k=3), third trimester (SMD=-1.51; 95% CI=-2.56 to -0.46; I2=95%; k=4), and the combined second and third trimester (SMD=-1.20; 95% CI=-1.87 to -0.54; I2=98%; k=18) demonstrated significant improvements in sleep quality. Both exercise (SMD=-0.73; 95% CI=-1.22 to -0.25; I2=90%; k=8) and cognitive behavioral therapy for insomnia (CBT-I) (SMD=-1.41; 95% CI=-2.56 to -0.26; I2=86%; k=3) led to significant improvements in sleep quality. These interventions also resulted in an increase in subjective nocturnal sleep duration (SMD=0.59; 95% CI=0.11 to 1.07; I2=86%; k=8), particularly with the use of eyemasks and earplugs during the third trimester (SMD=0.41; 95% CI=0.22 to 0.60; I2=46%; k=2), and improved subjective sleep efficiency during the combined second and third trimesters (SMD=0.92; 95% CI=0.29 to 1.52; I2=24%; k=2). Additionally, these interventions reduced subjective sleep onset latency (SMD=-0.53; 95% CI=-0.90 to -0.15; I2=49%; k=2). Furthermore, there was an increase in objective total time in bed during the third trimester (SMD=0.30; 95% CI=0.02 to 0.57; I2=0%; k=2). Objective sleep efficiency also saw a significant increase due to the interventions (SMD=0.19; 95% CI=0.01 to 0.38; I2=32%; k=5), especially during the combined second and third trimester (SMD=0.60; 95% CI=0.17 to 1.04; I2=0%; k=2).
Conclusion: Overall, non-pharmacological approaches appear to be beneficial for sleep-related outcomes in pregnant women. Future research should investigate intervention effects across trimesters and explore sleep-related outcomes, incorporating subjective and objective data.
Support (if any):

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0412

LONG-TERM TREATMENT OUTCOMES FOR CBT-I IN BLACK AMERICANS: 3 & 6-MONTHS PILOT STUDY RESULTS

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Introduction: In the US, Black Americans (BA) are disproportionately impacted by sleep continuity disturbance (SCD; i.e. insomnia) and insufficient sleep duration (ISD; i.e., < 6hrs). Simultaneously, treating SCD and ISD may improve health and reduce sleep disparities experienced by BA. However, Increased risk for, and severity of, SCD and ISD in BA suggests that BA may respond differently to cognitive behavior therapy for insomnia (CBT-I). The primary reason is that standard CBT-I ranges from six to eight sessions (i.e., directly addresses SCD) but does not increase total sleep time and therefore may not adequately address ISD during acute treatment. A pilot study was conducted to assess the acceptability of CBT-I to treat insomnia in BA, and address whether increasing sessions of CBT-I (i.e., > standard 8) will effectively address ISD. This study evaluates insomnia severity and sleepiness outcomes at 3- and 6- months post CBT-I treatment follow-ups.
Methods: Twelve BA adults (83% female, Mage 46.0±13.9yrs) were recruited from the Philadelphia area to receive CBT-I treatment by a master CBT-I therapist via telehealth for up to 16 sessions. Participants completed daily measures of sleep continuity (sleep diaries) and weekly measures of insomnia severity. Follow-up assessments were conducted at 3 and 6 months. Descriptive statistics are provided to show change in insomnia severity and sleepiness from baseline to post, baseline to 3-months and baseline to 6 months among the sample. Analyses were conducted using SPSSv27.
Results: Overall, on average, insomnia severity was reduced by 58% (effect size [ES]=1.3) at post, 61% (ES=1.8) at 3 months, and 67% at 6 months (ES=1.9). For sleepiness, on average, severity was reduced by 18% (ES=.2) at post, increased to 38% (ES=.7) at 3 months, and reduced to 28% (ES=.4) at 6 months.
Conclusion: Results from this pilot study indicate that standard CBT-I may produce robust effects. Reductions in insomnia severity and sleepiness remained durable at 6 months follow-up. Future studies with larger sample sizes are needed to explore further the use of CBT-I to treat sleep health problems in BA.
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0413

EXPLORING THE EFFICACY OF CANNABINOL IN SLEEP ENHANCEMENT: A BREAKTHROUGH IN NON-INTOXICATING SOLUTIONS

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Introduction: Sixty percent of Americans report getting less than the recommended seven hours of nightly sleep. Poor sleep is a public health concern linked to many health issues, including inflammatory conditions, obesity, heart disease and reduced quality of life. As consumers seek natural, safe alternatives for better sleep, the introduction of a non-intoxicating hemp-derived cannabinoid solution presents an attractive option.
Methods: Conducting the first-ever double-blind, randomized, placebo-controlled trial, an independent clinical research company examined the effects of TruCBN, FloraWorks proprietary ultra pure CBN on sleep patterns. The trial involved over 1,000 participants at least 21 years old from across the US, comparing the outcomes of CBN to melatonin and a placebo. There were three CBN groups, one melatonin group and one placebo group, as follows: CBN groups: 25 mg, 50 mg, 100 mg Melatonin: 4 mg Control: placebo
Results: - The group taking 50 mg of CBN showed significant sleep improvements compared to placebo, and most of the group experienced a clinically important improvement. - The group taking 4 mg melatonin also showed significant sleep improvements compared to the placebo. - The group taking 50 mg of CBN had slightly better sleep improvements compared to 4 mg of melatonin. - The groups taking 25 mg and 100 mg of CBN had marginally significantly better sleep improvements compared to placebo. - All three tested doses of CBN are statistically equivalent

to one another, and statistically equivalent to 4 mg melatonin, for improving sleep quality. All three doses of CBN show a Minimal Clinically Important Difference (MCID) with respect to placebo. - All side effects were mild or moderate. There were no significant differences in the frequency of reported side effects between any dose of CBN or melatonin compared to placebo.
Conclusion: Beyond illuminating CBN's efficacy in enhancing sleep, this research positions it as a formidable player in the pursuit of superior sleep aids, disrupting the conventional over-the-counter sleep aid market. The discovery that CBN is at least as effective as melatonin for improving sleep is particularly promising, especially given the side effects of melatonin and the growing concerns surrounding children consuming melatonin beyond recommended limits.
Support (if any):

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0414

DOSE-RESPONSE OF DARIDOREXANT IN INSOMNIA DISORDER: A META-ANALYSIS OF PHASE 2 AND 3 STUDIES

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Introduction: Daridorexant is a dual orexin receptor antagonist approved for the treatment of insomnia disorder at two dose levels (25 and 50 mg). Dose-efficacy and -safety response relationships were evaluated using data from Phase 2 and 3 studies.
Methods: Data from one Phase 2 study evaluating daridorexant 5 mg, 10 mg, 25 mg, 50 mg and placebo for 1 month, and two Phase 3 studies investigating daridorexant 10 mg and 25 mg or 25 mg and 50 mg vs placebo for 3 months were used. Dose-response analyses at 1 month of double-blind treatment were performed using two statistical approaches: a linear regression approach based on individual patient data and a two-stage meta-analysis approach based on aggregated data. Efficacy endpoints were polysomnography-determined wake after sleep onset (WASO) and latency to persistent sleep (LPS), self-reported total sleep time and the Insomnia Daytime Symptoms and Impacts Questionnaire (IDSIQ) total score (Phase 3 only for the latter endpoint). Safety endpoints were the percentage of patients with at least one adverse event (AE) and at least one AE corresponding to somnolence/fatigue during the first month of the double-blind study periods.
Results: Pooled efficacy analyses included 2153 patients randomized to placebo (n=678), daridorexant 5 mg (n=60), 10 mg (n=365), 25 mg (n=679) and 50 mg (n=371). The dose-response was significant for both statistical approaches in the observed range of 0 to 50 mg at Month 1 for all four efficacy endpoints ($p< 0.01$). All dose-response relationships were linear except for LPS (two-stage meta-analysis) which showed a change in slope after daridorexant 10 mg, without reaching a plateau. No significant dose-response relationship was observed for any AEs during the first month; results were consistent across methods ($p>0.05$). AEs corresponding to somnolence/fatigue were low at all doses and relaxing the linear assumption (two-stage meta-analysis) showed no evidence of dose-dependency ($p=0.369$).
Conclusion: The data support a favorable benefit-risk balance for daridorexant 25 mg and 50 mg at 1 month of treatment. The greater efficacy and similar safety at 50 vs 25 mg support the use of daridorexant 50 mg as a starting dose in patients with insomnia disorder.
Support (if any): Idorsia Pharmaceuticals Ltd

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0415

REAL-WORLD DATA AND HEALTH-RELATED QUALITY OF LIFE IN TREATMENT OF CHRONIC INSOMNIA WITH DARIDOREXANT

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Introduction: Daridorexant was approved by FDA and EMA for the treatment of chronic insomnia. It is a new dual orexin-receptor anatgonist, which demonstrated its clinical efficacy and safety in randomized controlled trials. The real-world data including its influence on the health-related quality of life (HrQol) are not yet available. In this prospective observational study we investigate the influence of daridorexant on HrQol in patients with chronic insomnia.
Methods: Patients with chronic insomnia diagnosed following the DSM V criteria were included in the observational study in terms of the Mainz Sleep Registry (MAINZ-SLEEPREG). All patients received the standard dosis of daridorexant of 50mg/night. The evaluation of clinical parameters and HrQoL was performed before, as well as three and six months after the initiation of daridorexant. The collected night-time efficacy endpoints included wake time after sleep onset (WASO), latency to persistent sleep (LPS), total sleep time and self-reported total sleep time. The EuroQol5D (EQ5D Index and EQVAS: visual analogue scale) was used to evaluate HrQol.
Results: Study participants (n=63) were 52.7±11.0 years old and 58.7% of them were females. All applied night-time efficacy measures (WASO, LPF, total sleep and self-reported sleep time) showed a significant improvement by approximately 20-40% at the time points after three and six months ($p< 0.05$). At the follow-up after three and six months the EQ5D Index values (0.71±0.17 and 0.72±0.15, correspondingly) improved on daridorexant by 18% in comparison to baseline (0.61±0.17, $p< 0.05$). Similar increase of HrQol was observed on EQVAS (62.2±16.5 at baseline versus 73.9±19.8 and 74.6±18.9, $p< 0.05$).
Conclusion: The data from this real-word study shows that daridorexant not only significantly improves the night-time sleep of patients with chronic insomnia but it also increases their HrQol. These findings encourage farther real-world studies to investigate the role of daridorexant in the treatment of chronic insomnia in broader populations.
Support (if any):

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0416

THE EFFECT OF DOXEPIN 3 MG ON SLEEP LATENCY: RESULTS FROM A META-ANALYSIS OF TWO PHASE 3 TRIALS

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Introduction: Doxepin 3 and 6 mg are FDA-approved treatments for insomnia characterized by sleep maintenance symptoms. A large, randomized, placebo-controlled trial has confirmed the

sleep latency effects of doxepin 6 mg in a phase advance model of healthy adults. The antihistaminic effects of doxepin 3 mg may also lead to sleep latency benefits in adults with insomnia symptoms.
Methods: Two randomized, double-blind, parallel group, placebo-controlled phase 3 trials involving doxepin 3 mg in subjects with chronic insomnia were used to assess the sleep latency effects on night 1/day 2. Meta-analysis methods were used to assess latency to sleep onset (LSO) and latency to persistent sleep (LPS), each on a log scale, for subjects with evaluable data in the intent to treat analysis set. Subgroup analyses were performed for both LSO and LPS for subjects above and at or below the median baseline values. Fixed and random effects models were performed using generic inverse variance methods.
Results: The analysis included a total of 460 subjects. Among these subjects, 68.5% were female, 65.2% were White and 20.0% were African American. The mean age was 58.5 years (median 65 years). The baseline median LSO was 55 minutes and median LPS was 35 minutes. We observed limited evidence for heterogeneity (all p-values > 0.2) and therefore present fixed effects estimates only. Doxepin 3 mg improved LSO by 12% (RR=0.88; 95% CI [0.73 to 1.05]) and LPS by 22% (RR=0.78; 95% CI [0.64 to 0.94]) when compared to placebo. There was a non-statistically significant 6% improvement in LSO observed among subjects above the median (RR=0.94) and a 15% non-statistically significant improvement among subjects below the median (RR=0.85). A statistically significant 29% improvement in LPS was observed for subjects above the median (RR=0.71; 95% CI [0.56 to 0.91]) and a non-statistically significant 6% improvement for those below the median (RR=0.94). All subgroup data reflect results compared to placebo.
Conclusion: Doxepin 3 mg may be an effective option to treat sleep latency in adults with insomnia symptoms, especially those with a long latency to persistent sleep.
Support (if any): This work was supported by Haleon and Currax.

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0417

THE EFFECT OF CBT-I COMBINES WITH CRAVING MANAGEMENT STRATEGIES ON HYPNOTIC DISCONTINUATION

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Introduction: Although the use of hypnotics is recommended for short-term management, long-term use is quite common in clinical practice. Gradual tapering, either alone or in combination with cognitive-behavioral therapy for insomnia (CBT-I), has been shown to facilitate the discontinuation of hypnotics. However, some patients are unsuccessful with these strategies. Previous studies suggest that individuals having difficulty discontinuing hypnotic use may develop a craving for these drugs, and such craving is a significant barrier in discontinuing substances like alcohol or drugs. The present study aims to examine whether combining CBT-I with craving management strategies can enhance the success rate of discontinuing hypnotics.
Methods: Twenty-one patients with insomnia disorder, who had been taking hypnotics for over three months, were randomly assigned to a CBT-I group (N=11) or a CBT-I+CM (craving management) group (N=10). Participants in both groups received eight sessions of CBT-I along with a progressive tapering plan. Those in the CBT-I+CM group received additional craving management strategies. Outcome variables included the average number of pills taken per day, the Insomnia Severity Index (ISI), and the Hypnotic Urge Scale (HUS), assessed at baseline and at the end of the program.
Results: ANOVA results indicated a significant reduction in the number of pills taken daily at the end of the program for both groups (CBT-I: 1.96 to 0.24; CBT-I+CM: 1.17 to 0.03; F=61.59, p<.001) and in the HUS scores (CBT-I: 97.00 to 72.55; CBT-I+CM: 105.89 to 63.67; F=25.73, p<.001). Unexpectedly, in the ISI scores, only the CBT-I+CM group showed significant improvement at the end of the program (17.5 to 7.2; t=6.46, p<.001), while the CBT-I group did not show significant improvement (13.36 to 11.55; t=1.20, p=0.25). No significant differences were found between the CBT-I and the CBT-I+CM group in all outcome variables.
Conclusion: The results suggest that CBT-I, whether alone or combined with craving management strategies, can facilitate the tapering of hypnotics and the reduction of craving for them. The inclusion of craving management strategies proved beneficial in improving symptoms of insomnia and, thus, could be integrated into clinical practice. Future research should investigate the long-term outcomes of these strategies in managing hypnotic discontinuation, with follow-up evaluations.
Support (if any):

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0418

A DAY-BY-DAY PROSPECTIVE ANALYSIS OF STRESS AND HYPNOTIC CRAVING DURING HYPNOTIC TAPERING IN INSOMNIA

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Introduction: Craving plays a crucial role in the persistence and relapse of substance use. While hypnotic usage may differ from that of addictive substances, previous research has indicated that long-term use of hypnotics is associated with a craving for hypnotics among patients with insomnia. Stress, which is commonly linked to sleep disturbances, has also been shown to enhance cravings for substance use. The current study aims to investigate the relationship between stress and craving for hypnotics using day-to-day assessments.
Methods: Twenty-seven participants with insomnia disorder (age = 41.66 ± 12.88; Male:Female = 14:13), who had been taking hypnotics for more than three months, were recruited for a two-week study. During the first week, they were permitted to take their usual dosage of hypnotics, while in the second week, their dosage was reduced by 25%. Each night before bed, participants recorded the level of stress they experienced and their craving for hypnotics, both on a scale of 1 to 9. Data were collected through responses to questions delivered via a social media app (Line). Mixed Effects Models were utilized to examine the relationship between stress and craving, separating out between-subject and within-subject associations.
Results: The findings revealed no significant associations between stress and craving at the between-subject level for either week (β = -0.08, p = 0.77; β = 0.07, p = 0.80). However, at the

within-subject level, there was a significant association between stress and craving during the usual dosage week (β = 0.22, p < .05), but not during the reduced dosage week (β = 0.14, p = 0.17).
Conclusion: Our study indicates that there is no significant correlation between stress and craving across the participants. Conversely, within individuals, heightened stress was correlated with increased craving when participants were allowed to take their usual hypnotic dosage. These results underscore the importance of taking stress into consideration when assisting insomnia patients in managing their cravings for hypnotics.
Support (if any): National Science and Technology Council

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0419

THE PUBLICATION PROFILE OF RANDOMIZED CLINICAL TRIALS FOR THE TREATMENT OF INSOMNIA

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Introduction: There is a continuous need for the development and refinement of therapeutic interventions for insomnia. The implementation of these new treatments depends on robust results, and the publication of randomized controlled trials (RCTs) is often a requirement. The aim of this study is to describe the publication profile of randomized controlled trials (RCTs) about therapeutic interventions for insomnia.
Methods: A systematic review was performed on PubMed and Web of Science, searching for RCTs about pharmacological and non-pharmacological treatments for non-comorbid insomnia in adults. A bibliographic analysis was performed based on the publication year and the characteristics of the treatments evaluated in each included study.
Results: The sample comprised 64 RCTs related to pharmacological and 74 to non-pharmacological treatments. The individual interventions with the greatest publication outputs are digital cognitive-behavioral therapy (dCBTi, n=35), in person CBT-I (n=28) and zolpidem (n=22). Regarding zolpidem, the first RCT was published in 1993, the median publication year is 2008 and 0.71±0.97 RCTs were published per year. The first RCT about in-person CBTi was published in 2001, the median publication year is 2018 and 0.90±1.1 RCTs were published per year. The first RCT about dCBT-I was published in 2009, the median publication year is 2019 and 1.13±1.91 RCTs were published per year.
Conclusion: The publication output for pharmacological interventions has been substantial for zolpidem and DORAs only, while most other drug categories have not been analyzed by a significant number of studies. A remarkable increase in the amount of RCTs about CBT-I (especially dCBT-I) has been observed. The possibility of sponsorship bias should be considered as an important driver for the development of new digital interventions for insomnia.
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0420

CLINICIAN EXPERIENCE WITH IMPLEMENTING BRIEF BEHAVIORAL TREATMENT FOR INSOMNIA

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Introduction: Chronic insomnia significantly affects health, functioning, and quality of life for many Veterans, yet access to evidence-based behavioral insomnia care remains limited. This Hybrid III stepped-wedge trial aims to test the implementation and treatment effectiveness of delivering Brief Behavioral Treatment for Insomnia (BBTI) into the VA Primary Care Mental Health Integration (PCMHI) setting.
Methods: Enrolled clinicians, across the four sites (n=16) were interviewed after the 12-month implementation phase. The semi-structured qualitative interview focused on clinician experiences during the implementation phase, how access to the bundle of implementation strategies influenced their delivery of BBTI in PCMHI, specific strategies that were most or least helpful, and barriers that impeded implementation efforts. Interviews were transcribed and summarized using rapid qualitative analysis. Interview data was synthesized and organized into a template based on applicable Expert Recommendations for Implementing Change (ERIC) strategies.
Results: Participating clinicians rated BBTI as highly compatible in PCMHI settings, adaptable in its delivery, and an important intervention for meeting Veterans' needs. Clinicians felt supported during the implementation of BBTI through access to a variety of educational resources. The most frequently cited barrier to implementation was work infrastructure difficulties, including high caseloads and inadequate staffing. Another common barrier was Veterans' co-morbid diagnoses and other health issues taking precedence over insomnia care. Lastly, multiple sites struggled to engage primary care, and other referring, providers. To facilitate sustainable delivery of BBTI in the future, clinicians requested continued access to BBTI resources and education materials and recommended ongoing group discussion and consultation amongst PCMHI clinicians.
Conclusion: Clinicians rated BBTI as a high-quality intervention with high mission alignment and were eager to continue providing BBTI after the study's conclusion, despite implementation barriers. When integrated with implementation outcomes (i.e., reach, effectiveness, adoption, implementation, maintenance), front-line clinician perspectives and feedback can support efforts to foster sustainable delivery of BBTI and can inform a larger-scale rollout of BBTI into the VA PCMHI setting.
Support (if any): VA Health Services Research and Development (I01 HX003096; PI Bramoweth)

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0421

DO ONLINE TRAININGS REALLY WORK? ONE YEAR FOLLOW-UP OF PROVIDERS WHO COMPLETED CBTI TRAINING THROUGH CBTIWEB

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Introduction: Online trainings to learn new skills and interventions are growing in popularity for mental health practitioners. Such platforms show promise for exponentially improving dissemination of evidence-based treatments and subsequent accessibility for individuals in need of effective care. However, minimal research has been done on the long-term impact of these trainings. CBTIweb was developed to train providers in cognitive behavioral therapy for insomnia (CBTI) and launched on April 1, 2020. The aim of the present study was to assess retention of knowledge about insomnia and CBTI and implementation of CBTI by providers approximately one year following their completion of CBTIweb.
Methods: Providers who completed CBTIweb within the first three months following the launch (N = 624) were contacted via email. Upon consent they were asked to answer the same test questions that were given as part of the CBTIweb training and complete an online survey. The survey included number of patients receiving CBTI in past year, items related to self-efficacy for CBTI delivery, barriers to implementing CBTI into their practice, and desire for resources that would increase effective implementation.
Results: Of the 624 providers who were contacted, 233 completed the test questions and survey. The vast majority passed the test (87%) and reported using CBTI in their practice since completing training (73%). Self-efficacy was positively associated with CBTI use. The most commonly cited facilitator of implementation was ease of access to handouts and other web-based tools designed to improve interaction with patients. The most common barriers were time required to prepare for sessions, difficulty finding supervision, accommodating comorbid conditions, and low patient buy-in.
Conclusion: The majority of providers who completed CBTIweb retained the information they learned in the training and implemented CBTI into their practice, indicating this online training format is a useful avenue for disseminating and implementing CBTI and other evidence-based treatments. Development of resources that would streamline delivery of CBTI, including simplifying patient handouts to minimize therapist preparation time, would likely lead to an increase in use of CBTI. Other barriers, including accessibility of supervision and low patient buy-in, warrant further investigation.
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0422

COGNITIVE BEHAVIORAL THERAPY FOR INSOMNIA: THE FIRST LINE TREATMENT FOR INSOMNIA REMAINS ELUSIVE

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Introduction: Cognitive Behavioral Therapy for Insomnia (CBT-I) is a highly efficacious behavioral intervention for insomnia. However, no one has quantified to what extent United States citizens are familiar with or have used CBT-I (compared to other treatments like medication). This descriptive analyses study assessed the proportion of Americans that were familiar with and have used forms of sleep intervention, including CBT-I.
Methods: 3,082 participants across the United States were surveyed through Cloudresearch Connect. The mean age was 39.6 (Range = 18-85). The sample comprised of 48.7% women and 71.3% identified as White. Participants were asked (on a 7 point Likert scale) questions about sleep health. Participants were asked about their familiarity with insomnia treatments including: prescription and over-the-counter (OTC) medications, Melatonin, CBTI, Sleep Hygiene, Sleep Restriction Therapy (SRT), Stimulus Control Therapy (SCT), Relaxation or Mindfulness Meditation Therapy, and Light Therapy. Participants were asked if they had used any treatments prior to or within the past 12 months. Participants also completed the Insomnia Severity Index (ISI).
Results: Participants rated the importance of sleep on their physical (M = 6.2; SD = 0.99) and mental (M = 6.4; SD = 0.96) health. 52.7% of the participants had at least subthreshold insomnia (ISI score < 8). 17.7% had clinically elevated insomnia (ISI score > 15). As for familiarity with various sleep treatments, 65.5% recognized prescription medications (e.g., Ambien), 69.3% recognized OTC medications (e.g., antihistamines), 80.5% recognized melatonin, 15.1% recognized CBT-I, 26% recognized sleep hygiene, 4.4% recognized SRT, 5% recognized SCT, 47% recognized Relaxation or Mindfulness Meditation Therapy, and 26.4% recognized Light Therapy. Among participants with at least subthreshold levels of insomnia, only 3.6% used CBT-I in the past 12 months, and 5% had used it at least once. In the past 12 months, 49.2% had used OTC medication and 13.8% had used prescription medications.
Conclusion: The data shows that CBT-I remains under-utilized. The majority of participants only knew of medication (prescription and OTC) treatments for insomnia. Efforts to identify and address the barriers to increasing awareness and availability of CBT-I are important and could help struggling insomniacs compared to other methods previously attempted.
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0423

INSOMNIA MANAGEMENT PROGRAM IN PRIMARY CARE CAN IMPROVE SUBJECTIVE SLEEP QUALITY AND INSOMNIA SEVERITY INDEX (ISI)

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Introduction: Insomnia is the most common sleep disorder affecting up to 30% of the US population with Chronic Insomnia at 10%. Cognitive behavioral therapy for insomnia (CBT-I) has been recommended as the first line treatment and standard of care by the American College of Physicians and American Academy of Sleep Medicine. The goal of CBT-I is to help remedy symptoms and improve sleep quality with the aim of eliminating the reliance on prescription medications. Nonetheless, the use of CBT-I is limited while the use of sleep medications remains high, up to 8% of the US population. The aim of this pilot was to test the use of self-guided CBT-I using mobile app (CBT-I Coach) to reduce chronic insomnia and decrease the need for new sleep aide prescriptions.
Methods: The one-arm pilot was conducted in a diverse, large university-based family medicine practice. Family medicine providers (n=11) received education on insomnia and recommended primary management with CBT-I. Patient recruitment was completed in 8 weeks and included both referrals and from chart

reviews (ICD 10 codes for insomnia). Participants received sleep education including sleep hygiene education and insomnia management with a CBT-I mobile app.
Results: The 23 participants, aged 25 to 64, reported significant improvement in ISI from moderate to sub-threshold insomnia (baseline M=19.26, SD=3.60 to final M= 14.04, SD=7.0, paired t-test=4.47, df=22, p<.001, Cohen's d=.93). In response to the intervention, 54.5% assessed their insomnia as "improved", 36.4% as "stable", and only 9.1% as "worse." 71.4% of those taking prescribed medications rated their insomnia as "stable", 66.7% of those taking Melatonin rated their insomnia as "improved" and 66.7% of those taking nothing at all rated their insomnia as "improved." Notably, for those taking any sleep aide or medication, there was neither an increase in dosage nor a new prescription during this study.
Conclusion: Primary care implementation of a self-guided insomnia management program delivered through the app CBT-I Coach can improve sleep quality and insomnia severity. This intervention can especially be beneficial for those taking nonprescription sleep aide (melatonin) or no medication at all.
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0424

EVALUATING SEDATIVE-HYPNOTICS EDUCATION ACROSS DIVERSE COMMUNITIES USING COMMUNITY ALIGNMENT THEORY

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Introduction: Since the late 1990s, misuse of prescription sedative-hypnotics like benzodiazepines (BZDs) and non-benzodiazepines (non-BZDs) has surged, becoming a significant public health issue. To address this, a community health program was evaluated for its effectiveness in raising awareness, providing preventive education, and implementing interventions. The study assessed a comprehensive health promotion initiative involving healthcare providers, trained community members, and volunteers to encourage responsible use of sedative-hypnotics among diverse populations.
Methods: The study employed Community Alignment Theory to emphasize the significance of cohesive collaboration among community members, organizations, and institutions, aiming to achieve sustainable and impactful outcomes. Eight experienced institutions across various regions, proficient in implementing individual and population health education programs, were selected with support from academic universities and non-governmental organizations (NGOs). These entities actively participated in developing and executing comprehensive programs. To assess awareness regarding the accurate use of sedative-hypnotics, five-item questionnaires were developed. These questionnaires exhibited a high content validity index of over .85, determined by eight experts, and demonstrated strong internal consistency reliability of .89.
Results: Eight institutions across diverse regions collaborated with 161 stakeholders and enrolled 875 participants, comprising 447 males (51.1%) with an average age of 58.3 ± 17.6 years. The current prevalence of insomnia, occurring at least three days a week, stood at 15.2% (n=133), with over half of the participants (n=466, 53.3%) having sought medical assistance for insomnia. Following the execution of 646 educational programs conducted in 275 locations and 13,348 participants attended, there was a significant improvement in awareness regarding insomnia and the appropriate utilization of sedative-hypnotics (p<.001). This enhancement encompassed various aspects such as daytime naps, sleep hygiene, prescription adherence, and awareness of hypnotics' adverse effects.
Conclusion: The utilization of the community alignment theory serves as a fundamental framework for steering educational initiatives within communities, demonstrating advantageous impacts on promoting the precise utilization of sedative-hypnotics.
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0425

DETECTING INSOMNIA AND PREDICTING DIFFICULTY FALLING ASLEEP: MACHINE LEARNING OF HEART RATE DATA DURING SLEEP ONSET

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Introduction: Insomnia is highly prevalent and difficulty falling asleep is the most common complaint. The transition from wakefulness to sleep is characterized by a shift from sympathetic to parasympathetic regulation, which can be assessed by heart rate dynamics. Using a machine learning approach, we aimed to explore whether heart rate dynamics during sleep onset can indicate the presence of insomnia.
Methods: We used data from a multi-center cohort study (Sleep Heart Health Study) and included 1835 subjects (age 40-90 years, mean age 62.2±11.2 years, 50.8% male) with overnight polysomnography-based sleep studies and validated sleep scorings. Heart rate data during sleep onset was analyzed using heart rate variability time domain measures (NN, SDNN, RMSSD, pNN20) and a nonlinear measure (multiscale entropy). These measures along with basic demographic features (age, sex and BMI) were used as features in machine learning. We ran four commonly used machine learning approaches, including support vector machines (SVMs), decision tree, random forest, and K-nearest neighbors (KNN), with 80% data for training and 20% for testing.
Results: Based on the mean of test accuracy of five iterations for each model, the highest accuracy for detecting insomnia was achieved by random forest (mean accuracy of 0.902), followed by SVM (mean accuracy 0.894), decision tree (mean accuracy 0.892), and KNN (mean accuracy 0.891). When using the same features to predict self-reported difficulty falling asleep during the study night, SVM achieved the highest accuracy (0.68) while the accuracy of the other approaches were slightly lower.
Conclusion: Machine learning models may effectively predict insomnia using demographic features and heart rate data during

sleep onset, but unbiased analysis is needed for the next step. With wearable technology, easily accessible heart/pulse rate data may provide valuable detection of physiological alteration during sleep onset and offer an evaluation approach for the efficacy of interventions targeting sleep onset difficulties.

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0426

GRAPH CONVOLUTIONAL NETWORK (GCN)-BASED PREDICTION OF BRAIN AGE IN INDIVIDUALS WITH INSOMNIA

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Introduction: The impact of insomnia on brain aging and cognitive function remain undisclosed. The Brain Age Index has arisen as a robust biomarker for assessing an individual's brain health, quantifying the deviations from normative aging trajectories. This study investigates accelerated brain aging in insomnia suffers compared to non-suffers using the Brain Age Index, exploring its correlation with the neurocognitive function.

Methods: Forty chronic insomnia patients (31 females, mean age 51.2 years) and 80 healthy controls (57 females, mean age 52.0 years) were analyzed. Graphical convolutional networks (GCNs) constructed regional brain age prediction models, integrating cortical morphology and topology data for comprehensive graph structure. Cortical thickness and gray-/white matter intensity ratio mapped on the cortical surface mesh were input to the GCNs. Ten brain network regions (sensorimotor, frontoparietal, dorsal attention, ventral attention, default mode, salience, language, auditory, visual, and limbic) were employed in the analysis of regional brain ages, utilizing automated anatomical labeling. Each model was trained on data from 6,563 healthy controls, with five-fold cross-validation indicating approximately three years of mean absolute error. These models computed the Brain Age Index for 80 healthy sleepers and 40 insomnia individuals. Linear regression models, adjusted for age, sex, and Beck Depression Inventory, scrutinized group disparities in regional Brain Age Indices. An additional analysis explored the association Brain Age Index and neuropsychological test utilizing linear regression analysis.

Results: While the global Brain Age Index revealed no significant group differences, notable regional Brain Age Index distinctions emerged in insomnia subjects. The regional Brain Age Index were significantly elevated in three distinct brain network regions—limbic, frontoparietal, and language (in descending significance order)—compared to normal subjects. The Brain Age Index within the language network exhibited a discernible negative correlation with neuropsychological deficits in attention and visuospatial domains.

Conclusion: This pioneering study validates neuroimaging-driven brain age in chronic insomnia, unveiling accelerated brain aging in distinct regions. Such revelations signify the potential impact of insomnia on the brain aging trajectory independently of chronological age. The potential association between accelerated brain aging in the language network and cognitive impairments has the potential to elucidate the intricate interplay between brain aging patterns and cognitive performance.

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0427

ASSESSMENT OF FIRST-NIGHT EFFECT IN PATIENTS WITH INSOMNIA USING THE ODDS-RATIO-PRODUCT (ORP)

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Introduction: Studies on first-night effect using conventional sleep metrics have been inconclusive. ORP is an objective index of sleep depth and wake propensity ranging from 0 (very deep sleep) to 2.5 (full wakefulness). ORP provides more in-depth information about sleep. We compared several ORP-derived metrics measured during three consecutive PSGs in patients with and without insomnia.

Methods: Participants (n=119) were screened with the Insomnia Severity Index and clinical interviews and assigned to either control (n=50) or insomnia (n=69) groups. Participants completed 3 nights of in-laboratory polysomnography. After each PSG, participants answered the question "How was your night in the lab compared to a night at home?" on a 1 (much better) to 5 (very mediocre) scale. The following variables were compared across the three nights with repeated-measures ANOVA. Questionnaire response (Q); average ORP during stages wake (ORPW), NREM (ORPNR) and REM (ORPREM) sleep; percent of recording time in deep sleep (ORP< 0.5) and in full wakefulness (ORP>2.25); average instantaneous difference between right and left ORP (R/L ORP difference), a measure of interhemispheric dissociation in sleep depth; frequency (hr-1) of transient increases (>2.0) in ORP during NREM sleep (WII); along with total sleep time (TST), % time awake (%wake), minutes in stages NREM3 (N3 time) and REM sleep (REM time); arousal index (AI).

Results: There were no differences between nights 2 and 3 in any variable. Q decreased beyond night-1, indicating improvement relative to home. The following significant changes were observed in night-2 in both insomnia and control groups (Tukey's test): ORPNR and ORPREM decreased (deeper sleep); more time in deep sleep (ORP< 0.5) and less time in full-wakefulness (ORP>2.25); less WII. The following significant changes were observed in night-2 only in participants with insomnia: Lower ORPW, indicating less alertness during stage W, and less R/L ORP differences. TST marginally increased and N3 time and AI marginally decreased in insomnia while %wake decreased marginally in both groups.

Conclusion: This study demonstrated clear first-night effects in several EEG microstructure variables in both control and insomnia participants, while the latter also showed reduced alertness and improved R/L agreement in sleep depth beyond night-1.

Support (if any):

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0428

COMPARATIVE ANALYSIS OF SLEEP PHYSIOLOGY USING QUALITATIVE AND QUANTITATIVE CRITERIA FOR INSOMNIA SYMPTOMS

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Introduction: Insomnia is diagnosed based on subjective difficulty falling asleep, staying asleep, and early morning awakenings. Evidence of objective EEG abnormalities is mixed, in part due to small sample sizes and variable definitions of insomnia. This study aimed to explore these issues by comparing the insomnia case group and the control group on sleep physiology objectively measured depending on separate qualitative and quantitative self-reported insomnia symptoms.
Methods: Analyses are based on questionnaires and PSG data from the Sleep Apnea Global Interdisciplinary Consortium (SAGIC). Two distinct insomnia case groups were defined. A qualitative insomnia case was defined as self-reported difficulty falling or staying asleep at least 3 nights/week for more than 3 months and moderate or greater impairment in daytime function due to poor sleep (n=350, 58% female; 48.47±14.38 years). The quantitative case definition required average self-reported sleep latency or wakefulness after sleep onset >30 minutes combined with the frequency and impairment criteria. (n=196, 62% female; 48.77±13.74 years). We also defined control groups without insomnia. Participants were excluded if they had sleep apnea (apnea-hypopnea index [AHI] > 5 events/hour) or were shift workers. Multivariate analysis of variance (MANOVA) models, adjusted for age and sex, were separately conducted to compare the insomnia and control groups. The focus was on traditional sleep architecture variables, EEG power within specific frequency bands, and odds ratio product (ORP, representing sleep depth) metrics.
Results: The MANOVA analysis indicated significant group differences, with post-hoc tests identifying key variables responsible for these distinctions. In qualitative criteria, sleep onset latency, sigma, beta1, and beta2 in EEG1 and EEG2, along with REM and NREM ORP, were significant contributors to the observed differences. In quantitative criteria, besides the same result in qualitative criteria, REM stage and alpha in EEG1 and EEG2 played significant roles. Effect sizes were consistent across both qualitative and quantitative criteria.
Conclusion: While the analyses depending on qualitative and quantitative criteria did not have different effect sizes, some variables contributed to the group differences. As such, the results of this study support the idea that qualitative and quantitative criteria measure the same dimensions for physiological differences related to insomnia.
Support (if any):

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0429

SLEEP MISPERCEPTION IN INSOMNIA PHENOTYPES BASED ON OBJECTIVE SLEEP DURATION IN YOUNG ADULTS

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Introduction: Prior research has suggested that the underestimation of total sleep time (TST), i.e., so-called sleep misperception, may be a trait feature of those with insomnia. Prior studies have also shown differences in the degree of sleep misperception across insomnia phenotypes, however, these findings have not been replicated in population-based samples of young adults.
Methods: We studied 270 young adults (median 25 years, 53% female, 24% racial/ethnic minority) from the Penn State Child Cohort who underwent a 9-hour polysomnography (PSG) recording, clinical history, and self-report surveys. Insomnia symptoms were defined as reports of difficulties initiating or maintaining sleep, insomnia diagnosis or complaint, and/or sleep medication use. PSG-measured short sleep duration was defined by the median of the sample (i.e., < 7-h), identifying normal sleep duration (NSD), short sleep duration (SSD), insomnia with normal sleep duration (INSD) and insomnia with short sleep duration (ISSD). Subjective TST was ascertained from a morning questionnaire completed immediately upon awakening from the PSG as well as from a retrospective survey of habitual sleep at home. A general linear model tested mean differences in TST-discrepancy across the four groups, while adjusting for sex, race/ethnicity, age, waist circumference, sleep apnea, cardiometabolic disorders, medication and substance use.
Results: INSD consistently underestimated TST, regardless of whether it was assessed upon awakening in the lab (-37.9±7.7 min; p< 0.001) or by reports of habitual sleep (-41.5±9.1 min; p< 0.001), while ISSD showed relative accuracy when TST was assessed upon awakening in the lab (8.9±7.8 minutes) and clear overestimation (85.9±9.2 minutes) when assessed by reports of habitual sleep.
Conclusion: Sleep misperception is a trait feature of individuals with INSD, who underestimate their sleep duration regardless of method of measurement used. These data suggest that the INSD phenotype may respond better to therapies addressing the cognitive and cortical underpinnings of this phenomenon.
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0430

ODDS RATIO PRODUCT AS A BIOLOGICAL MARKER OF HYPERAROUSAL IN INSOMNIA WITH SHORT SLEEP DURATION

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Introduction: Odds-Ratio-Product (ORP) is an objective, continuous index of sleep depth and wake propensity ranging from 0 (very deep sleep) to 2.5 (full wakefulness) and measured in consecutive 3-second epochs. We investigated differences in ORP metrics in 69 insomnia patients with objectively short and normal sleep duration, and 50 controls.

Methods: Participants were recruited from the community and were screened with the Insomnia Severity Index and clinical interviews and assigned to either control or insomnia groups. Participants completed three nights of in-laboratory overnight polysomnography and the Odds Ratio Product (ORP) was computed from central EEG signals. Using average total sleep time (TST) of nights 2 and 3, patients with insomnia were divided into those with short sleep duration (< 6 hours; ISSD; n=20) or normal sleep duration (INSD, n=49). Percent of TRT spent in different ORP deciles was calculated along with average ORP over wake time (ORPWAKE, higher values reflect greater alertness), and NREM sleep (ORPNREM, higher values reflect lighter sleep). We also measured the frequency of wake intrusions (transient increases (>2.0) in ORP per hour of NREM sleep).
Results: Patients with ISSD had higher ORPwake than controls (p=.017) when controlling for age, spent more time in full wakefulness (decile 10, ORP>2.25) than the other groups (p<.001), less time in deep sleep (ORP< 0.5) than INSD (p=.018), and had a higher wake intrusion index than patients with INSD (p=.015). Absolute misperception of sleep onset latency was associated with ORPNREM (p=.003), ORPTRT (p=.008), and wake intrusions (p=.012) in ISSD, and ORPTRT (p=.009) and wake intrusions (p=.025) in controls, such that a greater degree of misperception was associated with elevated ORP and greater disruption to sleep.
Conclusion: Patients with insomnia and short sleep duration had evidence of physiological hyperarousal in EEG measured by ORP compared to controls and patients with insomnia and normal sleep duration. Sleep fragmentation, measured with ORP, was also associated with misperception of sleep onset latency in patients with short sleep duration and controls. These results can assist with the characterization of insomnia phenotypes. Differences in physiological hyperarousal within phenotypes of insomnia could suggest more targeted treatment pathways.
Support (if any):

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0431

TRANSCRANIAL ELECTRICAL STIMULATION WITH A WEARABLE DEVICE DRAMATICALLY REDUCES SLEEP ONSET LATENCY IN INSOMNIA

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Introduction: The normal transition to sleep is characterized by a reduction in higher frequency activity and an increase in lower frequency activity in frontal brain regions. In sleep onset insomnia these changes in activity are weaker and may prolong the transition to sleep. We performed a translational study to investigate the impact of a new wearable neurotechnology using 0.75 Hz transcranial electrical stimulation (tES) to improve sleep outcomes in a population displaying symptoms of sleep onset insomnia.
Methods: Participants were enrolled based on a qualifying insomnia severity index score of greater than 7 and an average sleep onset latency of greater than 30 minutes during baseline monitoring. Using a wearable device we compared 30 minutes of 0.75 Hz tES prior to going to bed with an active control at 25 Hz in the same individuals. Sleep behaviors were tracked in the home using a FitBit inspire wrist worn actigraphy device. Sleep onset latency (SOL), time asleep, and wake after sleep onset were measured during one-week baselines and then again over the two, one-week periods of use with the wearable device. Neurophysiological responses to both stimulation frequencies were observed using electroencephalography within the wearable device and correlated with observed differences in sleep behaviors. All outcome measures were compared against pre-stimulation baselines within subjects and then averaged across subjects.
Results: Treatment with 0.75 Hz consistently reduced SOL by 54% when compared with pre-treatment baselines (p<< 0.001). Stimulation with 25 Hz reduced SOL by 28% (p< 0.05) but displayed order effects suggesting the possibility of placebo. The reduction in SOL with 0.75 Hz treatment was linearly proportional to an individual's baseline with those individuals with the greatest severity realizing the greatest benefit (r^2 = 0.62, p<< 0.001). Changes in SOL were correlated with left/right coherence around the stimulation frequency of 0.75 Hz (r^2 = 0.33, p< 0.01) providing a possible mechanism. Time asleep was increased by 20 minutes with 0.75 Hz treatment (p< 0.05), and -1 minute with 25 Hz (N.S.).
Conclusion: Our study provides translational evidence for an exciting new treatment for sleep onset insomnia that is safe, effective and can be delivered in the home.
Support (if any):

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0432

NEUROMODULATION OF REM SLEEP: AGE-ASSOCIATED EFFECTS OF TRANSCRANIAL MAGNETIC STIMULATION

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Introduction: We recently reported findings from a project that used a form of repetitive transcranial magnetic stimulation (rTMS) known as continuous theta burst stimulation (cTBS) to modulate connectivity within the brain's Default Mode Network (DMN) as a potential treatment for insomnia. Continuous theta-burst stimulation(cTBS) was used to reduce cortical excitability within the DMN. Our prior analyses showed that the approach significantly improved total sleep time, sleep efficiency, N3 latency, and the arousal index, but rapid eye-movement (REM) did not appear affected. Based on growing evidence that REM sleep may show changes in the third decade and beyond, and that the effects of rTMS may be, at least partially, influenced by age, we further explored the potential effect of age in this dataset.
Methods: cTBS was administered to a total of 20 participants with self-reported insomnia symptoms (Mage=26.90, SD=6.56). Each participant underwent one round of sham stimulation and one round of active cTBS in a randomized order with one week in between. Participants were monitored with polysomnography (PSG) during a 7-hour sleep window. We first examined the association between age and REM sleep at each visit. A repeated measures ANOVA was employed, incorporating age as a covariate to assess potential age-dependent effects on cTBS effects.
Results: REM duration was positively correlated with age for the active cTBS visits (r=0.506, p=0.023) but not for the sham (r=-0.059, p= .806). With age as a covariate, the ANOVA revealed a significant effect of TMS treatment on REM sleep duration, F(1,18)=7.507, p=0.013. Participants in the TMS

treatment group experienced an increase in REM sleep duration compared to the sham group when age was controlled in the analysis.
Conclusion: Age significantly influenced the effect of cTBS on REM sleep outcomes. The finding that older individuals demonstrated a greater effect of stimulation on REM duration suggests potential implications for clinical application in individuals with insomnia. Future work may focus on refining therapeutic strategies for sleep modulation, advocating for a personalized and age-aware approach.
Support (if any): US Army Medical Research Acquisition Activity Grant: W81XWH2010173

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0433

SUPPRESSION OF THE DEFAULT MODE NETWORK AFFECTS THE AROUSAL AND REDUCES TIME IN NON-RESTORATIVE SLEEP

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Introduction: We recently demonstrated that continuous theta burst stimulation (cTBS), a form of suppressive transcranial magnetic stimulation (TMS), was effective at improving total sleep time, sleep efficiency and arousal index scores in people with symptoms of insomnia (Killgore, 2023, zsad077.0332). We now present additional analyses on the effects of this stimulation on functional brain activation during a complex cognitive task (multi-source interference task; MSIT) that targets the cingulo-frontal-parietal cognitive/attention network and its correlations with overnight polysomnography (PSG).
Methods: Nineteen people (11 females) with moderately severe symptoms of insomnia (age=27.2 SD=6.6), underwent active or sham cTBS followed by an overnight PSG monitored sleep study on two counterbalanced occasions separated by at least a week. Immediately before and after each cTBS/sham stimulation, participants completed functional MRI scans that included the MSIT. Contrasts were created between the more difficult interference condition and the simple control condition and task activation changes were compared across time and treatment condition using paired t-tests, repeated measures ANOVA, and within-condition Pearson's correlations.
Results: A paired t-test of the primary task contrast (interference>control) maps showed a significant decline from pre- to post-treatment in a region of the supplementary motor area (SMA) for the active cTBS ($p < 0.001$, FWE corrected), but no change for the sham condition, as evidenced by a significant time x treatment interaction ($p=.004$). Moreover, for the sham condition, activation of this region was correlated with more time in wake/non-restorative sleep (i.e., wake, N1, N2, awakenings, and arousal index, all p-values<.05), while for the active cTBS, changes in activation within this region were no longer associated with indices of poor sleep.
Conclusion: Building on our previously reported finding that cTBS reduced arousal and improved sleep time, this analysis suggests that activity within the SMA may play a role in mediating the insomnia-related symptoms with respect to arousal. Under sham conditions, increased activity of the SMA was associated with increased awakenings and arousal index. This disruptive effect appears to be eliminated by cTBS to the DMN. This result raises the possibility that insomnia symptoms may be partially mediated through the interactions between DMN and cognitive-attention networks.
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0434

EFFECT OF DYNAMIC BINAURAL BEATS ON SLEEP QUALITY: A PROOF-OF-CONCEPT STUDY WITH QUESTIONNAIRE AND BIOSIGNALS

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Introduction: The key pathomechanism of insomnia involves hyperarousal, which increases anxiety, stress, and alertness during the pre-sleep initiation period and interferes with the ability to initiate or maintain sleep. Hyperarousal is associated with disrupted autonomic nervous system (ANS) regulation during the process of sleep initiation. Binaural beat (BB) sounds subjectively perceived by listeners when each ear is presented with a small frequency difference. BB has been investigated as a potential modality to enhance sleep quality and to reduce sleep latency. In this study, we introduce a new form of BB, referred to as dynamic BB (DBB), which incorporates dynamically changing carrier frequency differences between the left (fixed at 100 Hz) and right (oscillates between 100-103 Hz) ears, yielding a frequency difference range of 0 to 3 Hz. We evaluated the effects of DBB on sleep quality using polysomnography (PSG) parameters, electroencephalography (EEG), and ANS function regulation measured using heart rate variability (HRV).
Methods: Ten healthy participants were included in a crossover design, where they experienced both DBB and a SHAM (absence of sound) condition across two consecutive nights, with PSG evaluation. DBB was administrated during pre-sleep initiation, sleep onset, and transition from rapid-eye-movement (REM) to non-REM stage (non-REM transition). Sleep latency, sleep efficiency, relative portion of each sleep stage on PSG, relative power of each frequency band in EEG, and mean HRV and its low/high frequency power were compared to evaluate the effect of DBB.
Results: DBB significantly reduced sleep latency as well as marginally increase sleep efficiency compared to the SHAM condition. Moreover, HRV was significantly lower for the DBB condition than the SHAM condition in both pre-sleep initiation and sleep onset periods, and LF power did in sleep onset period, indicating its ability to suppress the activity of the sympathetic nervous system—associated with arousal—and to enhance the parasympathetic nervous system, consequently facilitating a swifter transition into sleep.
Conclusion: DBB might be effective in improving the sleep quality, suggesting its possible application in insomnia treatments.
Support (if any):

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0435

CONTINUOUS THETA-BURST STIMULATION LOWERS THE IMPACT OF ANXIETY ON SLEEP DURATION IN INDIVIDUALS WITH INSOMNIA

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Introduction: Repetitive Transcranial Magnetic Stimulation (rTMS) is a procedure by which a magnetic coil is used to stimulate specific regions of the brain to bring about alterations in function. Continuous theta-burst stimulation (cTBS) is a form of rTMS that was used to suppress cortical excitability and lower within network connectivity in the Default Mode Network (DMN). Connectivity within the DMN is associated with rumination and mind-wandering. Prior research indicates that pre-sleep anxiety is associated with increased sleep latency and decreased sleep continuity. As part of a larger project, we hypothesized that pre-sleep anxiety would negatively impact total sleep time, as measured by polysomnography (PSG), but that this effect would be reduced or eliminated in the active cTBS condition compared to sham.
Methods: We administered cTBS to 20 participants with insomnia symptoms (Nmales = 8, Mage=31.6, SD=6.7) (Nfemales =12, Mage=23.8, SD=4.3). Participants then underwent one administration of sham stimulation and one administration of active cTBS to the left angular gyrus node of the DMN in a randomized order separated by one week. The State Trait Anxiety Inventory (STAI-S) was administered immediately before each session, and PSG data was collected during overnight laboratory stays following the TMS sessions. We ran two linear regressions between STAI-S scores and total sleep time - one analysis for the sham condition and another for the active condition.
Results: Elevated STAI-S scores (M=41.6, SD=6.984) predicted decreased total sleep time (Mean minutes=393.75, SD=48.45) for the sham cTBS condition ($F(1,18)=8.689$, $p=.009$; $\beta=-.571$, $p=.009$). In contrast, the relationship between STAI-S scores (M=40.9, SD=50.35) and total sleep time (Mean minutes=403.8, SD=5.34) was not significant for the active cTBS condition ($F(1,18)=2.409$, $p=.138$; $\beta=-.344$, $p=.138$).
Conclusion: Prior data presented from this trial revealed that active cTBS improved TST overall. However, here we further demonstrated that higher pre-sleep anxiety predicted a lower sleep duration for the sham cTBS condition but not for the active cTBS condition, suggesting that the active cTBS may mitigate the effects of anxiety on sleep. These findings support the applicability of continuous theta-burst stimulation in treating psychiatric conditions related to sleep difficulties, such as anxiety.
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0436

COMBINING INSOMNIA THERAPY WITH SLEEP TRACKING USING WEARABLES: EFFECTS OF A CBT-I-BASED APP ON SLEEP - A RCT STUDY

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Introduction: Due to the gap in non-pharmacological insomnia treatment, effective and validated digital solutions are urgently needed. So far, digital cognitive behavioral therapy for insomnia (CBT-I) options are comprised of a therapy program and subjective measurements in form of a sleep diary. Objective sleep measurements are usually not included. Here, we evaluate an innovative smartphone app (NUKKUAA®), combining i) a CBT-I-based sleep training with ii) subjective as well as iii) objective sleep monitoring via a wearable heart rate (HR) sensor, and iv) feedback based on such objective data. A RCT study was conducted to investigate effects on sleep and subjective-objective sleep discrepancies (SOSD).
Methods: Fifty-seven self-reported poor sleepers (20-76 years; MAge=45.67±16.38; 39 female) were randomly assigned to an experimental group (EG, n=28) or a waitlist control group (CG, n=29). During a 6-week intervention phase, the EG used the CBT-I-based app program including subjective and objective sleep monitoring as well as feedback on their sleep, while the CG used sleep monitoring only. Sleep was measured i) subjectively with questionnaires (Insomnia Severity Index, ISI; Pittsburgh Sleep Quality Index, PSQI), ii) objectively with ambulatory polysomnography (PSG), and iii) continuously via a HR sensor and sleep diaries.
Results: Analyses revealed interactions for ISI ($p=.003$, $\eta2part=.11$) and PSQI ($p=.050$, $\eta2part=.05$), indicating training-specific improvements for EG, yet not for CG. While PSG-derived outcomes appear to be less training-specific, a tendential reduction in wake after sleep onset (WASO) was found in EG ($p=.061$, $d=0.55$). Regarding changes in SOSD, results indicate a SOSD reduction during intervention for total sleep time in both groups, while improvements for sleep efficiency, sleep onset latency and WASO were found in EG only ($p's \leq .022$, $d \geq 0.46$).
Conclusion: The findings indicate beneficial effects of an innovative smartphone app on sleep and SOSD. More scientific evaluation of such digital programs is needed in order to ultimately help reducing the gap in non-pharmacological insomnia treatment and provide affected individuals with sufficient treatment options and effective, low-threshold support for their sleep problems.
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0437

THE EFFECTS OF A 6-WEEK SINGLE-BLIND ONLINE CBT-I PROGRAM ON DAILY SUBJECTIVE AND OBJECTIVE SLEEP PARAMETERS

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Introduction: Insomnia exerts a substantial impact on a considerable portion of the population, resulting in significant detriments to health, workplace safety, and overall quality of life. Digital treatment programs have currently made effective and easily accessible treatment options possible. In our current study, we examine the impact of a 6-week single-blind digital CBT-I program by daily tracking sleep quality, duration, and fragmentation, subjectively and objectively. Tracking sleep objectively was made possible using an innovative sleep staging method founded on heartbeat variability and machine learning, enabling access to daily sleep macrostructure (i.e., a hypnogram).
Methods: Fifty-six participants with self-reported sleep problems were randomly assigned to either a control or an experimental group. Both groups used a mobile smartphone application daily to provide subjective reports and track their sleep using a heart-rate wearable (H10, POLAR®) over the course of 6 consecutive weeks. Only the experimental group completed the sleep training program (e.g., included educational videos, relaxation exercises, and cognitive training). We examined changes in subjective and objective sleep parameters using mixed Analysis of Variance with the factors Group (Control, Experimental) and Time (Beginning, End). We also analysed significant interactions with paired samples t-tests. Spearman correlations were used to examine the changes in daily sleep parameters over time.
Results: Only the experimental group showed higher subjective sleep quality ($t=-3.8$, $p<.001$) and shorter sleep onset latency ($t=3.1$, $p=.006$) at the end of the program. Among the objective sleep parameters, we found a small but statistically significant increase in the amount of deep sleep ($t(25)=-2.93$, $p=.007$), while the number of awakenings ($t(25)=2.21$, $p=.03$) and the number of sleep stages ($t(25)=2.17$, $p=.04$) showed a significant decrease from the beginning to the end of the sleep training.
Conclusion: The results reported in the current study indicate significant improvements in subjective sleep parameters and objective sleep parameters throughout a digital CBT-I sleep training program. When assessing the effects of digital interventions, it is important to consider daily and long-term objective sleep-related parameters.
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0438

OPTIMIZING VIRTUAL INSOMNIA THERAPY FOR WOMEN: INSIGHTS FROM AN INSOMNIA PILOT PROGRAM IN AUSTRALIA

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Introduction: Insomnia, a prevalent sleep disorder, poses unique challenges for women, often compounded by coexisting women's health and mental health conditions. This study explores the accessibility and viability of a virtual insomnia therapy program tailored for women, leveraging cognitive behavioural therapy for insomnia (CBT-i) delivered via telehealth.
Methods: The pilot, conducted from May to August 2023, was advertised through email and social media campaigns. Basic demographic information and sleep issues were collected. Respondents were then given the opportunity to engage in a pilot program involving telehealth CBT-i sessions and digital sleep diaries. Information on women's sleep attitudes and issues were collected. Participation rates, therapy adherence, and participant feedback were analysed to evaluate program effectiveness and identify barriers to therapy.
Results: 61 women, predominantly aged 40 and above (90%), all experiencing sleep challenges for over three months responded to the campaign. Of the 61 women, five chose to actively engage in the pilot program. Of these, 1 completed treatment, 1 had trouble obtaining a GP referral, 2 dropped out due to travel/competing priorities, and 1 did not want to pay upfront out-of-pocket cost. Despite these challenges, the participants reported high satisfaction (average score: 8.9 out of 10) and a strong likelihood to recommend the program (Net Promoter Score: 100). Notably, all participants had coexisting women's health and mental health conditions, and 60% had a previous diagnosis of obstructive sleep apnea (OSA).
Conclusion: The pilot demonstrated the potential and challenges of engaging women with complex health needs in virtual CBT-i for insomnia through targeted advertising. Although satisfaction among participants was high, indicating its effectiveness, the modest engagement rate highlights the need for strategies that not only reach women but also enhance their understanding of insomnia and its treatment. This suggests that while targeted advertising is a promising approach for providing direct access to insomnia treatment, it needs to be complemented with other strategies, such as healthcare referrals and comprehensive psychoeducation about insomnia and CBT-i to enhance treatment access and adherence, especially for women with complex health needs.
Support (if any): ResMed.

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0439

ANALYSIS OF RESPONDERS TO SELF-HELP SLEEP INTERVENTIONS IN A STEPPED-CARE CLINICAL TRIAL AMONG SCHOOLTEACHERS

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Introduction: Schoolteachers often struggle with inadequate sleep or poor sleep quality, placing them at a heightened risk of depression and other mental health conditions. Cognitive behavioral treatment for insomnia (CBTi) has been found to be effective for alleviating depression while bypassing the associated stigma toward mental illnesses. Given the potential of CBTi, we tested the efficacy of delivering CBTi using a stepped-care approach among schoolteachers.
Methods: This study utilized preliminary data from a group of schoolteachers (N = 118) who received stepped care sleep treatment in an on-going assessor-blinded, randomized, waitlist-control trial. We examined the factors associated with clinical remission in sleep problems following self-help interventions (i.e., receiving sleep hygiene education as Step 1, and, if necessary, following with a 6-week self-help app-based CTBi ("proACT-S") as Step 2). Remission was defined based on their responses after treatment (i.e., at the end of Step 1 or Step 2), classifying participants as responders (i.e., good sleepers) and non-responders (i.e., poor sleepers) using a cutoff value of 5 points on the Pittsburgh sleep quality index (PSQI).

Results: At baseline, participants reported mean scores of 10.7 on PSQI and 9.5 on The Kessler Psychological Distress Scale (K6), indicating poor sleep quality without noticeable mood symptoms. Out of 94 participants who completed end-of-treatment assessment, 16.0% achieved good sleep quality after receiving sleep hygiene education, while an additional 11.7% achieved good sleep quality through the completion of app-based self-help CBTi. Multivariate logistic regression with multiple imputations indicated that participants who reported poor sleep at baseline but without clinical-level insomnia (scored < 8 on Insomnia Severity Index) had a higher odds of good sleep quality at the post-treatment follow-up (aOR = 13.2, 95% CI = 5.0–152.9, p = .04) compared to those with moderated insomnia symptoms. This association was controlled for teachers' mood and stress symptoms, along with other demographic factors.
Conclusion: For teachers who had poor sleep but without clinical-level insomnia, offering online psychoeducation and, if necessary, self-help CBTi may prevent them from developing clinical insomnia.
Support (if any): This project is supported by the Health and Medical Research Fund from the Food and Health Bureau,HKSAR (project no: 18191811).

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0440

AN INTERNET OF THINGS COGNITIVE BEHAVIORAL THERAPY-BASED DEVICE REDUCES INSOMNIA SEVERITY AND INCREASES SLEEP TIME

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Introduction: An estimated 34-million U.S. adults suffer from chronic insomnia. The first-line treatment for this disease is Cognitive Behavioral Therapy for Insomnia (CBT-I). However, poor access, high cost, and low adherence prevent its widespread use. Full Sleep is a novel Internet of Things (IoT) device that includes an intelligence-sensing radar to passively track sleep patterns and deliver in the moment behavioral prompting to promote adherence to CBT-I directives.
Methods: The effect of the IoT device was examined on participants with moderate to severe insomnia symptoms (n = 65). Participants were recruited through a website and consented to a 6-8 week program. The IoT device was hypothesized to improve the Insomnia Severity Index (ISI) (primary outcome), evaluated at baseline and post-treatment. The IoT device was also hypothesized to improve consensus sleep diary metrics. Exploratory hypotheses included increasing total sleep time and reducing depression and anxiety on survey assessments.
Results: A within-groups paired-comparison t-test showed significant improvements in the ISI from baseline 19.3 (SD = 2.5) to post-treatment 7.4 (SD = 4.6), t(43) = 16.89, p < .001, d = 2.5, a 62% decrease. A clinically significant change is 6-points, demonstrating a dramatic improvement, and a larger effect than reported by digital therapeutics like Somryst, which found a 45% decrease in the ISI. There was also evidence of a causal relationship between improvements in the ISI and the use of the IoT device, where the more that participants engaged with the feature that promoted getting out of bed during restless nights, the greater the improvement in the ISI score r(42) = .37, p < .05. Importantly, the intervention also increased total sleep time, from 6.3 hours (SD = 1.4) to 6.8 hours (SD = 1.4), t(51) = 4.14, p < .05, and sleep efficiency from 73.6% (SD = 13.7%) to 88.6% (SD = 8.9%), t(51) = 9.9, p < .05. Participants had a reduction in dysfunctional beliefs about sleep, depressive symptoms, and anxious symptoms (ps < .05).
Conclusion: These results support that innovative technologies that work alongside CBT-I directives can reduce insomnia severity and increase total sleep time.
Support (if any): This research was supported by Koko Home Inc.

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0441

SLEEP DISTURBANCE IN MCI: A PILOT STUDY OF A COGNITIVE BEHAVIOURAL THERAPY DIGITAL INTERVENTION (SUCCEED)

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Introduction: Insomnia is common in older adults with mild cognitive impairment (MCI) and predicts future cognitive decline. Cognitive Behavioural Therapy for insomnia (CBT-I) is the first-line treatment for insomnia but is often unavailable. We tested the feasibility of a randomised controlled trial comparing 12-weeks of digital CBT-I vs wait-listed control in older adults with MCI and insomnia.
Methods: This was an investigator-initiated (NCT05568381), parallel open-label randomised-controlled feasibility trial. Participants were randomised to digital CBT-I (Sleepio, 6-weekly sessions) or a wait-listed control (3 fortnightly online modules of a sleep health education package) via a secure centralised platform which was also used to collect the outcome data. This study was undertaken remotely without in-person visits. Potential participants were recruited through online advertising and a memory clinic in Sydney, Australia. Those who met initial eligibility were invited to a screening and informed consent telehealth consultation. Inclusion criteria included adults aged ≥50 years, with an Insomnia Severity Index (ISI)>10, who met the clinical criteria of MCI on a neuropsychological battery (performed over telehealth for participants recruited online). The primary outcomes were the proportion of participants who met screening and randomisation criteria. A secondary outcome was the effect sizes and 95%CIs of the difference in ISI between the groups at week 12.
Results: Recruitment occurred March 23, 2023 to August 11, 2023 stopping when we reached our pre-defined sample size (digital CBT-I=19; control=21; 30 females; mean [SD] age=59.7 years [7.3]; ISI=17.0 [3.7]). 37% of participants issued a pre-screening number (n=246), were eligible to attend online screening. 47% of those issued a screening number (n=90) were eligible to be randomised (n=42). All randomised participants (n=40) were recruited through the online pathway. At 12-weeks there was a difference in ISI between the digital CBT-I (mean±SE 7.8±1.1 points) and control groups (13.7±1.05 points) (Cohen's D [95%CI] -1.6 [-2.4 to 2.1]). 79% of participants completed ≥4 out of the CBT-I 6 sessions. All adverse events were minor and transient.
Conclusion: This population can be recruited through online pathways and follow the protocol as well as adhere to the intervention of this remotely conducted trial.
Support (if any): CogSleep CRE Seed Funding Grant. BigHealth- intervention in-kind.

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0442

A QUALITATIVE ASSESSMENT OF DIGITAL COGNITIVE BEHAVIORAL THERAPY FOR INSOMNIA IN HEAVY DRINKERS WITH INSOMNIA

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Introduction: Insomnia, a public health problem impacting approximately 10-30% of the population, is both a risk factor for Alcohol Use Disorder and a common comorbid condition. Evidence suggests that intervening on sleep problems could serve as a novel and efficacious means of simultaneously improving sleep and problematic drinking. This study qualitatively and quantitatively assessed a well-validated, interactive version of digital cognitive behavioral therapy for insomnia (dCBTI) in heavy drinkers with insomnia. We report on qualitative themes related to beliefs about alcohol's impact on sleep, self-reported positive outcomes of the dCBTI program, and aspects of the program that participants found most helpful.
Methods: Heavy drinking men (n = 28) and women (n = 42) with insomnia were randomly assigned to complete either the dCBTI program or a control patient education program. Semi-structured qualitative interviews were conducted at baseline and after program completion. Interviews were digitally recorded, professionally transcribed, and lasted approximately 45 minutes on average. The first and second authors conducted and coded the interviews using a multi-stage, inductive process aided by NVIVO software. Here we report on data from pre-intervention interviews with all 70 subjects and post-intervention interviews with the dCBTI subjects (n=40).
Results: At baseline most participants did not associate their heavy drinking habits with their difficulties in falling or staying asleep. Some participants reported using alcohol to help them fall asleep more quickly or "pass out." Participants who participated in the dCBTI program reported improved ease in falling asleep, fewer nighttime awakenings, and the ability to fall more readily back asleep if they experienced early or nighttime awakenings. These participants also reported a new or increased understanding of the ways in which alcohol use impacted their sleep. Participants reported that having to track their daily number of drinks, and learning to stop drinking several hours before bedtime were the most helpful components of the dCBTI program.
Conclusion: Heavy drinkers with insomnia may lack awareness of how alcohol use impacts their sleep or believe that alcohol helps them sleep. Using a well-validated version of dCBTI may be an accessible, efficacious means of improving two burgeoning public health problems.
Support (if any): NIAAA R21 AA029201, T32 AA027488

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0443

CHANGE IN SLEEP-COGNITIONS AFTER DIGITAL OR THERAPIST-LED COGNITIVE BEHAVIORAL THERAPY FOR INSOMNIA IN OLDER ADULTS

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Introduction: Traditional therapist-led cognitive behavioral therapy for insomnia (CBTI) is associated with a shift to more adaptive cognitions about sleep, as measured by the Dysfunctional Beliefs and Attitudes about Sleep Scale (DBAS). To address unhelpful beliefs about sleep, CBTI uses cognitive therapy strategies. This study sought to assess the degree to which changes in DBAS differ between patients receiving digital CBTI (dCBTI) and those receiving therapist-led CBTI after two months of treatment access.
Methods: The RCT of the Effectiveness of Stepped-Care Sleep Therapy in General Practice (RESTING) study evaluated a triaged stepped-care framework for delivering dCBTI and therapist-led CBTI. Based on a study-developed checklist, 137 (M age=63.26 years [SD=7.79], 69% female) participants were identified as candidates who would likely benefit from higher intensity CBTI. However, these candidates were randomly assigned to one of two study arms: online only (n=68) or stepped care (n=69). Those in the online only arm received dCBTI, and those in the stepped care arm received therapist-led CBTI. Both arms included the same CBTI components, but therapist-led CBTI additionally included a module on supporting reduction in sleep medications. Participants completed the 16-item DBAS at baseline and two months post randomization. Multilevel modeling was used to examine changes in DBAS scores and subscale scores, including Expectations, Worry/Helplessness, Consequences, and Medication subscales.
Results: There were no significant differences in DBAS scores between participants receiving dCBTI and those receiving therapist-led CBTI (Beta=-0.05, SE=0.21, p=.82). At the level of subscale scores, compared to dCBTI, therapist-led CBTI was associated with greater reduction in dysfunctional beliefs in the 3-item Medication subscale (Beta=-1.10, SE=0.34, p=.001).
Conclusion: Whereas there was no differential impact of delivery mode on overall DBAS scores, therapist-led treatment resulted in greater change in DBAS Medication subscale scores for participants pre-identified as those who would benefit from higher intensity treatment. Specifically, therapist-led interventions might be especially effective for changing beliefs that insomnia has a biochemical etiology and that sleep medications are necessary for better sleep. Changing such beliefs may be an important element in supporting sustained improvement and potentially reducing sleep medication use.
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0444

A DIGITAL THERAPY BASED ON REAL-TIME SLEEP SENSING DATA

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Introduction: CBT-I has been known to be effective in treating insomnia. However, CBT-I showed problems such as shortage of medical staff and the need to visit the hospital several times. Therefore, CBT-I had implemented as digital CBT-I to overcome those demerits. However, it takes about over 6 weeks and is very tedious. In addition, it requires daily sleep diary to evaluate the efficacy of CBT-I treatment. These lowered patient's compliance. To overcome this, a new digital CBT-I with sleep sensing device is proposed.

Methods: The proposed digital CBT-I was developed based on four basic ideas: (1) 17h of activity and 7h of sleep (2) discrepancy between desired time in bed (TIB) and desired total sleep time -DBST index (3) TIB during 24h and (4) taking sleeping pills 7h before wake-up time. The digital CBT-I consists of four weeks sessions: (1) sleep hygiene education (W0), (2) 17h of activity and 7h of sleep (W1), (3) educating about DBST index (W2), (4) TIB during 24h (W3), (5) final evaluation (W4). The clinical trial was a double-blind, randomized with 30 participants (15 test and 15 control) who were over ISI > 15 at W0. Conventional digital CBT-I were provided for control, and SOMNUM Scanning were used to record automatic sleep diary for all groups.
Results: ISI of test group were W0=18.9, W1=13.9, W2=12.0, W3=10.8, W4=10.2, and ISI of control group were W0=19.1, W1=16.1, W2=15.5, W3=14.2, W4=13.1. In terms of the proportion of participants whose ISI was reduced by < 15 at each visit, there was a significantly higher proportion in the test group than in the control group at W2 (83% vs. 43%,).
Conclusion: The results showed a significant improvement in ISI scores in both test and control groups. However, the mean ISI score of test group was significantly lower and the proportion of participants with ISI score below 15 points was also significantly higher at W2. This means that insomnia may improve at a faster rate when patients use the proposed this solution. This result also showed that automatic sleep diary recording by SOMNUM Scanning will be helpful to increase patient's compliance.
Support (if any):

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0445

COMPARING ADHERENCE FOR A PRESCRIPTION DIGITAL THERAPEUTIC FOR INSOMNIA ACROSS CONTROLLED AND REAL-WORLD SETTINGS

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Introduction: Digital Cognitive Behavioral Therapy for insomnia (dCBT-I) offers scalable first-line treatment versus face-to-face care, but a potential trade-off is lower treatment adherence. In clinical trials, adherence rates to dCBT-I have been variable, and there is no defined standard for acceptable adherence to dCBT-I. Further, the generalizability of adherence data from clinical trials to real-world settings is unknown. This study compared adherence data from two dCBT-I clinical trials to adherence within a real-world study.
Methods: The dCBT-I intervention was a prescription digital therapeutic (Somryst) that includes 6 treatment Cores (e.g., sleep restriction, stimulus control) delivered over 9 weeks. Participants must complete a Core and wait 7 days before starting the next Core. Clinical trial adherence data was derived from two RCTs previously submitted to FDA as part of its authorization (RCT-1 [USA; N=151, age 21-65 years] and RCT-2 [Australia; N=574, age 18-64 years]). Real-world adherence data was derived from a prospective, single-arm, pragmatic clinical study (DREAM [USA; N=991, age ≥18 years]). Adherence was defined as the percentage of participants with dCBT-I access who completed each treatment Core. Automated notifications prompt engagement with the therapeutic.
Results: Real-world adherence rates from the DREAM study were 94.1%, 71.1%, 60.7%, 55.7%, 49.1%, and 42.8% for Cores 1-6. For RCT-1, adherence rates of Cores 1-6 were 93.4%, 88.1%, 76.8%, 67.5%, 66.9%, and 60.3%, respectively, whereas adherence rates of Cores 1-6 in RCT-2 were 80.8%, 67.9%, 60.5%, 54.0%, 47.6%, and 40.8%.
Conclusion: Real-world adherence to dCBT-I appears comparable to RCTs, with the largest decrease occurring between Cores 1 and 2. These findings support the generalizability of adherence data from RCTs and potential opportunities to increase adherence early in treatment. Further work is needed to determine acceptable standards for adherence to dCBT-I in the real world.
Support (if any): DREAM study: Pear Therapeutics, Inc. RCT-1: NIMH grant #R01 MH86758; NCT01438697. RCT-2: NHMRC project grant #1005867; ACTRN12611000121965. Additional support provided by Nox Health, Inc.

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0446

IMPROVING ADHERENCE TO SLEEP RESTRICTION IN DIGITAL CBT-I

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Introduction: Treatment adherence has been a proposed barrier to the success of digital CBT-I (dCBT-I). Adherence to sleep restriction may be particularly important for treatment gains. One model of improving treatment adherence is to enhance dCBT-I with a nurse coach. This study compared adherence to sleep restriction between those with and without access to a nurse coach.
Methods: 288 individuals with insomnia (DSM-5 diagnostic criteria) were randomized into two conditions: enhanced dCBT-I (access to a nurse coach: n=148) and control (online program only: n=140). Those in the coaching model had an initial consult with the nurse coach focused on motivational enhancement, and then received feedback via email after each session based on sleep diary reports. Those who miss two consecutive sessions were stepped-up to telehealth coaching focused on implementing sleep restriction. All participants included in this preliminary analysis completed at least 3 sleep diary entries per week throughout the study. Sleep restriction was measured with sleep diary data, operationalized as the change in standard deviation of time in bed and wake time before and after the introduction of sleep restriction.
Results: Results indicate that those in the coaching group showed a greater mean reduction in the standard deviation of time in bed (coaching group: -53.3 min, control reduction: -35.9 min; Cohen's d = 0.23). Similarly mean changes in standard deviations of wake time was greater in the coaching group compared to the control group (coaching group: -19.0 min, control reduction: 1.2 min; Cohen's d = 0.22).
Conclusion: Results provide preliminary support that enhancing dCBT-I with nurse coaching may produce better adherence to sleep restriction. Future research should include sensitivity analyses, and examine the relationship between adherence to sleep restriction and improvements in symptoms.
Support (if any): Support for this study was provided from the National Heart Lung and Blood Institute R01HL159180 awarded to Dr. Philip Cheng.

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0447

UPTAKE OF FULLY AUTOMATED DIGITAL CBT FOR INSOMNIA IN THE HENRY FORD HEALTHCARE SYSTEM: THE FIRST 100 PATIENTS

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Introduction: Despite Cognitive Behavioral Therapy for Insomnia (CBT-I) being first line treatment for insomnia, primary care physicians typically treat insomnia with sleep hygiene or pharmacotherapy, but are unsatisfied with these approaches (Ulmer et al., 2017). Physicians may also lack knowledge about CBT-I (Dyas et al., 2010), or find it difficult to refer patients to receive therapist-delivered treatment due to a lack of trained providers (Haycock et al., 2021). Fully automated (without therapist support) digital CBT-I provides a solution with immediate, standardized, and convenient access for patients. This implementation project aims to embed evidenced-based digital treatment (Sleepio) in real world clinical practice within a large health care system (Henry Ford Health) and evaluate a novel clinical workflow.

Methods: Patients with insomnia who may benefit from CBT-I determined by their treating practitioner are offered Sleepio via the Epic electronic health records system at HFH Academic Internal Medicine (AIM) and Sleep clinics. Normalization Process Theory (May et al., 2016) was used to provide a framework to help embed digital CBT-I access. We report rates of electronic orders and Sleepio sign-ups for implementation and workflow acceptability. Leaflets and digital assets were distributed. Training sessions were also provided for clinicians at both the AIM and Sleep clinics. Email reminders helped promote access over time.

Results: As of December 13, 2023, N=565 electronic orders were placed by treating practitioners, and n=214 (38%) patients signed-up to start Sleepio (n=140 female, mean age=52.9 [range: 18-88]). The majority (84%) of patients were from sleep clinics. Adapting the electronic order process enabled clinicians to provide immediate digital access for patients. Senior staff training sessions at the sleep clinics were associated with a higher order rate across the Sleep clinics compared with the AIM clinic.

Conclusion: Fully-automated digital CBT for insomnia can be delivered as part of routine clinical care and electronic workflows with limited disruption to clinical practice. Normalization Process Theory enabled low-lift non-disruptive changes to clinical workflow over time allowing patients to obtain access to Sleepio. Training and reminding clinicians on how to introduce patients to a digital treatment helped increase uptake.

Support (if any): n/a

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0448

UPPER AIRWAY COLLAPSIBILITY IS ASSOCIATED WITH FLUID SHIFTS IN PATIENTS WITH SLEEP APNEA AND DIASTOLIC DYSFUNCTION

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Introduction: Left ventricular systolic dysfunction contributes to sleep-disordered breathing (SDB) pathophysiology through overnight rostral fluid shifts leading to fluid accumulation in the neck (increasing upper airway collapsibility) and pulmonary vasculature (increasing ventilatory control instability). In contrast to systolic dysfunction, the relationship of left ventricular diastolic dysfunction (LVDD) to overnight fluid shifts and SDB pathophysiology is less well characterized. In an ongoing prospective clinical study of patients with risk factors for or established LVDD and untreated SDB, we are using Phenotyping Using Polysomnography (PUP) analysis to investigate the relationship of overnight fluid shifts to upper airway collapsibility and ventilatory control instability.
Methods: Patients are enrolled in the presence of known LVDD or ≥1 risk factor (age ≥55 years, hypertension, diabetes, coronary artery disease, or amyloidosis) and known or suspected SDB with an apnea-hypopnea index (AHI3A) of ≥15 events/hr. Exclusion criteria include ejection fraction (EF) < 40% or factors suspected to interfere with LVDD indices or PUP estimates (e.g. ventricular dyssynchrony, severe lung disease). LVDD is confirmed on transthoracic echocardiography. Patients undergo in-lab polysomnography (PSG) with pre- and post-sleep circumference measurements of the neck and calves (averaged from both calves). PUP estimates of upper airway collapsibility (Vpassive) and ventilatory control instability (loop gain, LG1) are determined for the first and second half of sleep.
Results: 14 patients have been enrolled. Complete PSG data is available for 8 patients (age 52.6±10.7 years, 50% female, BMI 36.2±5.0 kg/m^2, AHI3A 28.7±18.4 events/hr, EF 63.0±7.0%). While neck circumference did not significantly change, calf circumference significantly decreased overnight (pre- vs post-sleep median [IQR] 39.4 [37.3-40.5] cm vs 38.6 [25.8-40.2] cm, p = 0.047). Overnight change in Vpassive was inversely correlated with overnight change in neck circumference (R = -0.82, p = 0.023) and positively correlated with overnight change in calf circumference (R = 0.76, p = 0.049). Correlations of overnight changes in LG1 with neck and calf circumferences were not significant.
Conclusion: PUP analysis suggests overnight rostral fluid shift in patients with LVDD contributes to upper airway collapsibility. This preliminary trend will be more fully investigated on reaching the enrollment goal of 30 patients.
Support (if any): AASM PSTA. NIH T32HL160511.

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0449

PILOT STUDY: AI-ENHANCED COMISA DIAGNOSIS IN HONG KONG PUBLIC HOSPITALS USING OBJECTIVE SLEEP AND HRV METRICS

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Introduction: The underdiagnosed and high overlapping prevalence of comorbid insomnia and obstructive sleep apnea (COMISA) often suffer worst cardiovascular outcomes than patients with either OSA or Insomnia. The scarcity of multidisciplinary clinics addressing both conditions may impede timely COMISA diagnosis and treatment efficacy. This study explored the feasibility of leveraging objective sleep and HRV metrics through Belun Ring (BR), the AI-powered wearable, to facilitate COMISA diagnosis and personalized treatment.
Methods: Consecutive suspected OSA or Insomnia cases were co-screened by clinical psychologist and pulmonologist. Participants were categorized into the OSA group if PSG-AHI ≥ 15 events/h, insomnia if Insomnia Severity Index (ISI) ≥ 15 or diagnosed based on the International Classification of Sleep Disorders, third edition (ICSD-3), or COMISA if meeting both conditions. All subjects completed a 3-night (≥ 100 mins/night) sleep assessment using the BR. Kruskal-Wallis tests and PCA analyses were conducted for comparative analyses among the three groups.
Results: Among 54 subjects, 31 had insomnia, 13 had OSA, and 10 had COMISA. Marked discrepancies between subjective and AI-generated sleep statistics (concordance rate= 0.07) COMISA exhibited the highest wake after sleep onset (median, mins) compared to insomnia and OSA (76.5 vs. 48.1 vs. 21.2, P< 0.001). COMISA and insomnia had upregulated wakefulness (median, count) compared to OSA (14.9 vs. 15.2 vs. 8.3, P< 0.05). Moreover, COMISA exhibited the lowest SDNN (median, ms) and RMSSD (median, ms) compared to insomnia and OSA (SDNN: 49.0 vs. 63.8 vs. 92.9, P< 0.01; RMSSD: 44.9 vs. 53.8 vs. 79.8, P< 0.01). COMISA had dropped PRR50 (median, %) compared to OSA (6.6 vs. 24.8, P< 0.05). Normalized LF and LF/HF did not differ across the three groups. The novel workflow reduced waiting time for consultation from 104 to 45 weeks.
Conclusion: This is the first study to demonstrate the use of AI-assisted sleep and HRV parameters to single-out COMISA for better personalized treatment and efficient workflow. The worst cardiovascular outcomes in COMISA patients were objectively reflected by the lowest SDNN and RMSSD findings. This novel study elucidated the potential how AI can assist to identify COMISA patients even in monodisciplinary settings for better patient care.
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0450

GENIOGLOSSUS MOTOR CONTROL DURING MANDIBULAR ADVANCEMENT AND INSPIRATORY RESISTIVE LOADING

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Introduction: High activity of the genioglossus muscle is thought to prevent/resolve upper airway collapse. The individual motor units that make up the overall genioglossal activity typically fire with one of five patterns: active only (IP) or at higher frequency (IT) during inspiration; active only (EP) or at higher frequency during expiration (ET); and constantly active without respiratory modulation (TT). Most experimental manipulations investigated thus far (hypoxia, hypercapnia, resistive loading and sleep onset/arousal) have largely influenced IP and IT motor units, with minimal changes in units with ET, EP and TT patterns. We hypothesized that IT/IP motor units respond to respiratory drive changes, whereas TT/EP/ET motor units will respond to manipulations of the airway anatomy.
Methods: Genioglossal motor units were assessed via four intramuscular electrodes in 20 healthy individuals during wakefulness. Genioglossal single motor units were quantified before and during mandibular advancement (MAD) to 80% of maximum with a myTAP device to change airway anatomy but minimally alter respiratory drive, as well as before and during inspiratory resistive loading (IRL) of 20cmH2O/l/s for 1-minute periods.
Results: 201 motor units were identified from 55 MAD trials and 234 motor units were identified from 58 IRL trials. Ventilation did not differ between baseline and MAD or IRL. The proportion of motor units with different patterns did not differ from baseline (EP=0.6%, ET=12.6%, IP=14.9%, IT=48%, TT=24%) to MAD (EP=0%, ET=10.2%, IP=21.1%, IT=36.7%, TT=31.9%), $\chi 2(7)=12.0$, p=.213. However, the proportion of motor units with different patterns differed from baseline (EP=0%, ET=15.4%, IP=34.6%, IT=32.4%, TT=17.6%) to IRL (EP=1.7%, ET=14.1%, IP=44.9%, IT=29.1%, TT=5.1%), $\chi 2(7)=15.8$, p=.0013. The peak firing frequency of motor units did not change during MAD (baseline=20.9±4.7Hz, MAD=21.9±5.4Hz) but increased during IRL (baseline=20.4±5.5, IRL=22.8±5.6Hz, p< 0.001).
Conclusion: While resistive loading increased the firing (rate and number) of inspiratory-phasic motor units as hypothesised, the firing of tonic and expiratory modulated motor units did not differ from baseline during mandibular advancement. What controls the non-respiratory/expiratory motor units of the genioglossus remains unclear.
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0451

DIFFERENT ROLES OF HOMOCYSTEINE METABOLISM IN HYPERTENSION AMONG NORMAL-WEIGHT AND OBESE PATIENTS WITH OSA

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Introduction: Obstructive sleep apnea (OSA) is causally associated with hypertension. However, the differential mechanisms underlying OSA related hypertension between normal-weight vs. obese patients is limited.
Methods: We studied 92 consecutive patients with OSA. Blood pressure (BP) was measured twice during awake and continuously monitored during nighttime sleep. Obesity and normal weight were defined as body mass index ≥ and < 28 kg/m2. Serum metabolite levels were assessed by metabolomics.
Results: Among 59 normal-weight and 33 obese patients, 639 and 174 metabolites showed differences between hypertension and normotension or were associated with systolic and diastolic BP (SBP, DBP) after controlling for confounders. These metabolites were significantly involved in 16 and 12 Kyoto Encyclopedia of Genes and Genomes enrichment pathways in normal-weight and obese patients, whereas 6 pathways overlapped between these two phenotypes. Among these 6 overlapping pathways, 4 pathways were related to homocysteine metabolism and the other two were non-specific pathways. In homocysteine metabolism pathway, 13 metabolites were identified by metabolomics. Interestingly, the change trends of 7 metabolites associated with SBP (all interaction-p≤0.081) and 8 metabolites associated with DBP (all interaction-p≤0.034) were opposite between normal-weight and obese patients. Specifically, in normal-weight patients increased BP was associated with down-regulated folate-dependent remethylation and accelerated transsulfuration whereas in obese patients increased BP was associated with enhanced betaine-dependent remethylation and reduced transsulfuration. Similar findings were observed in ambulatory BP during sleep.
Conclusion: Mechanisms in OSA related hypertension differ between normal-weight and obese patients, which can be primarily explained by the different systematic changes in homocysteine metabolism. Assessing the metabolites in homocysteine metabolism pathway may benefit personalized treatments for hypertension in these two OSA phenotypes.
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0452

C-REACTIVE PROTEIN IS ASSOCIATED WITH HYPERTENSION IN MILD-TO-MODERATE OBSTRUCTIVE SLEEP APNEA: AGE EFFECT

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Introduction: Mild-to-moderate obstructive sleep apnea (mmOSA) is highly prevalent in general population. It has been shown that mmOSA is a significant risk factor for the development of cardiovascular and cerebrovascular disease in young and middle-aged, but not in older adults. C-reactive protein (CRP) improves the ability to detect the individual risk for cardiovascular aberrations in young and middle-aged adults with mmOSA. However, it is unkown, whether CRP is also associated with hypertension risk in older patients with mmOSA.
Methods: Adults (n=208) of a wide age range (28-90 years old, mean age 52.88 ± 12.52) with mmOSA (5 ≤ AHI < 30) completed an in-lab polysomnography or home sleep testing, a physical examination including measures of blood pressure (BP) and body mass index, a structured medical history questionnaire, and a blood draw for CRP.
Results: In logistic regression models adjusting for sex and BMI, lnCRP but not AHI was associated with greater odds for hypertension (OR = 2.34, 95% CI = 1.19-4.62, p = 0.014, OR = 1.00, 95% CI = 0.93-1.09, p = 0.926 respectively). In adults ≥60 years neither lnCRP nor AHI were associated with hypertension (OR = 1.56, 95% CI = 0.78-3.11, p = 0.207 and OR = 1.02, 95% CI = 0.94-1.10, p = 0.690, respectively). Also, in adults aged < 60 years lnCRP was associated with greater average systolic (β = 0.214, p = 0.032) and diastolic BP (β = 0.230, p = 0.020) but not AHI (β = 0.026, p = 0. 826; β = 0.000, p = 0.998, respectively), while in adults ≥60 years neither lnCRP nor AHI were associated with greater systolic or diastolic BP.
Conclusion: These findings suggest that CRP is a stronger predictor of hypertension than AHI in young and middle-aged but not in older adults with mmOSA. Including a measure of CRP improves the ability for clinicians to detect cases of mmOSA at risk for hypertension in the younger group. It appears that inflammation is a primary pathogenetic mechanism in mmOSA in young and middle-aged adults but not in older ones.
Support (if any):

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0453

SLEEP APNEA-SPECIFIC HYPOXIC BURDEN AND DELTA HEART RATE IN RELATION TO ATRIAL FIBRILLATION IN A CLINICAL COHORT

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Introduction: Mechanistic animal studies implicate intermittent hypoxia and autonomic dysfunction in the pathogenesis of obstructive sleep apnea (OSA) and atrial fibrillation (AF). Polysomnographic correlates of hypoxia and autonomic fluctuations in OSA may be useful biomarkers of AF development. However, to date, novel, reflective physiologic sleep apnea-specific hypoxic burden (SAHB) and delta heart rate (DHR) have yet to be examined in AF. We hypothesize these novel measures are associated with incident AF.
Methods: Cleveland Clinic patients (age≥18) without AF who underwent polysomnography 1/2/2000-12/30/2017 were retrospectively examined. Cox proportional hazards models evaluated time from sleep study to AF by diagnosis code. SAHB (area under the respiratory event-related desaturation curve), DHR (respiratory event-related oximetry-based heart rate difference), apnea hypopnea index (AHI), and percent time oxygen saturation< 90% (T90) were examined as predictors adjusting for age, sex, race, body mass index(BMI), tobacco use, cardiopulmonary disease, anti-arrhythmic medications, and positive airway pressure. Signal analysis used Python. Statistical analysis used R and SAS.
Results: The sample included n=15,712 patients [age 50(40,60) years, 54% female, 74% White, BMI 32(28,38) kg/m2, AHI 12.8(5.6,26.6)] over 7.3±3.2-year follow-up. In unadjusted analyses, SAHB showed monotonic increases in incident AF across quartiles(p< 0.001). In adjusted analyses, 10-unit increased SAHB was associated with 2% increased incident AF (HR=1.02,95%CI=1.01-1.03). Similarly, 10-unit increased AHI and T90 were associated with 3% (HR=1.03,95%CI=1.01-1.06) and 8% (HR=1.08,95%CI=1.05-1.11) increased AF, respectively. DHR was analyzed in a subset with available data [n=5,930, age 46(36,56) years, 52% female, 76% White, BMI 33(28,39) kg/m2, AHI 11.6(5.2,24.7)] over 6.7±.3.2-year follow-up. Low vs. mid-range DHR was associated with 39% increased incident AF (HR=1.39,95%CI=1.08-1.80), attenuated with covariate adjustment; high-range DHR did not differ.
Conclusion: In this clinical cohort, signal-based measures of OSA-specific hypoxic burden and autonomic responses were associated with increased incident AF after accounting for confounders. Findings suggest that degree of hypoxia and a dampened heart rate response are important physiologic OSA-specific AF risk factors and precision medicine phenotypes to consider for treatment responsiveness and inclusion in clinical trials.
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0454

IN COGNITIVELY NORMAL ELDERLY, OBSTRUCTIVE SLEEP APNEA WORSENS SPATIAL NAVIGATIONAL MEMORY PERFORMANCE

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Introduction: Normal sleep has a favorable effect on the consolidation of spatial navigational memory. Previous work suggests normal overnight sleep enhances spatial navigation performance in a hippocampus-dependent manner. Our group has previously demonstrated post-sleep spatial navigational performance may be affected by obstructive sleep apnea (OSA). Here we aim to replicate these findings in a much larger sample size.
Methods: Using a virtual 3D Maze, 162 subjects (66.8 ± 6.5 years, 88 female) completed spatial navigational encoding and recall across their nocturnal polysomnography visit. Participants were instructed to find the maze exit within a ten-minute period

and were given three trials pre- and post-sleep. We compared overnight changes and trial-by trial completion times between participants with and without OSA (AHI4% > 5) using Wilcoxon signed-rank test.

Results: Of the 162 participants, 76 had OSA (10.5± 16.12 AHI4). There was no statistically significant difference in overnight change in completion time (%) between OSA/non-OSA groups (OSA: 2.5 ± 58.3, non-OSA: 9.9 ± 52.1). However, the average completion time worsened with each successive trial during encoding (pre-sleep) in OSA [T1: 305 ± 18, T2: 328 ± 21, T3: 345 ± 23 seconds] as compared to non-OSA [T1: 369 ± 20, T2: 324 ± 19, T3: 320 ± 20 seconds]. Further, we observed that the average completion time worsened with each successive trial during recall (post-sleep) in the OSA group [T4: 306 ± 20, T5: 296 ± 20, T6: 332 ± 20 seconds] as compared to the non-OSA group [T4: 331 ± 19, T5: 312 ± 20, T6: 277 ± 18 seconds], such that, in the final post-sleep trial (T6), OSA patients had significantly slower completion times than the those without OSA (p = 0.034).

Conclusion: Despite no difference in overnight change in completion time between non-OSA and OSA, the pattern of performance during encoding and recall was different; These observations suggest OSA may be creating a working memory deficiency more strongly than an offline processing deficiency. Future analyses evaluating PVT performance in the OSA and non-OSA groups may be instructive to probe whether a different domain of executive is also impacted and its relationship to subjective sleepiness.

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0455

SLEEP DURATION AND OSA SEVERITY IS RELATED TO ALTERED LIMBIC SYSTEM INTEGRITY IN COGNITIVELY NORMAL OLDER ADULTS

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Introduction: Impairments in the microstructure of the limbic tracts are seen in early stages of the Alzheimer's disease (AD) spectrum. Disrupted sleep has been linked with AD. We examined associations between measures of limbic white matter tracts and objective sleep parameters in cognitively unimpaired older adults.

Methods: This cross-sectional study included 170 community-dwelling cognitively unimpaired older adults (mean±SD: age=67.2±5.2y) participating in NYU studies of sleep, aging, and memory. Subjects completed polysomnography (NPSG) and brain MRI. Sleep measures of interest included total sleep time (TST), NREM stages 2, 3 and REM sleep duration, sleep efficiency and fragmentation, and AHI4% and REM AHI4%. Microstructural properties of the cingulum, uncinate fasciculus (UF), and fornix were estimated using diffusional tensor imaging (DTI) metrics including radial kurtosis (RK), radial diffusivity (RD), and fractional anisotropy (FA). Linear mixed-effects regression models examined associations between sleep variables and DTI metrics. Models were adjusted for age, race, education, sex, time between NPSG and MRI.

Results: Participants were 71.2% female, 44.1% Black/African-American, and had 16.8±2.5y of education. In the right cingulum, higher AHI4% in REM was associated with decreased RK(β[IV]= β[SE}; β[AHI4%] =-0.0014[0.00054], p=0.01) and shorter stage 2 sleep duration was associated with decreased RK (β [stage 2 sleep duration] =0.00062[0.00026], p=0.02). In both hemispheres of the cingulum, increased sleep fragmentation in stage 3 was associated with increased RD (β [sleep fragmentation, right] = 0.0017[0.00080], p=0.03; β [sleep fragmentation, left] = 0.0026[0.00087], p=0.003), and higher AHI4% in REM was associated with reduced FA (β [AHI4% left] =-0.00039[0.00019], p=0.048; β [AHI4% right] =-0.00055[0.00017], p=0.02). In the right UF, with increasing age, reduced TST was associated with lower RK(β[TST]=0.0000047[0.000002], p=0.02). In the right UF, reduced time in REM sleep was associated with increased RD (β [REM duration] =-0.0022[0.00078], p=0.006). In the fornix, higher AHI4% was associated with lower FA(β[AHI4%] =-0.00061[0.00029], p=0.04).

Conclusion: In this sample of community-dwelling cognitively unimpaired older adults, reduced sleep duration and OSA severity (NREM and REM) were associated with limbic white matter tracts alterations. Longitudinal studies are needed to investigate the role of disrupted sleep in limbic white matter microstructure alterations in early stages of the AD spectrum.

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0456

IMPACT OF HYPERTENSION AND SLEEP-DISORDERED BREATHING ON COGNITIVE DECLINE IN OLDER ADULTS

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Introduction: Hypertension is a major risk factor for cardiovascular diseases. Sleep disruption, circadian dysfunction, sleep-disordered breathing (SDB), and cognitive decline are increased with aging. Repeated episodes of end-apneic arousal or hypoxia and consequent sleep fragmentation are associated with increased nocturnal blood pressure, possibly leading to sustained hypertension and atherosclerosis. The relationship between blood pressure levels and cognitive function differs across the lifespan in observational studies. However, the roles of hypertension and SDB on the pathogenesis of age-related cognitive decline remain unclear. We investigated the effect of hypertension and SDB on cognitive decline in older adults.

Methods: The participants were 50 consecutive volunteers aged 60 years or older (mean age 69.2 ± 4.7 years) without impairment in daily living activities. Sleep apnea screenings were conducted using a portable monitor. We evaluated the respiratory

event index (REI) as the number of apnea and hypopnea events per hour during the recording time, with the minimum oxygen saturation. Sleep complaints were assessed using the Pittsburg sleep quality Index (PSQI). Excessive daytime sleepiness was evaluated by the Epworth sleepiness scale (ESS). Cognitive performance was assessed using the Wisconsin card sorting test (WCST), continuous performance test-identical pairs (CPT-IP), and N-back task. Hypertension and diabetes mellitus were evaluated via questionnaire. We measured systolic and diastolic blood pressure using pulse wave test.
Results: The percentage of correct answers on the 1-back tasks was significantly lower in the hypertension group than the non-hypertension group. The WCST category achievement was significantly lower in the participants with minimum oxygen saturation < 90% than those with minimum oxygen saturation ≥ 90%. Minimum oxygen saturation was correlated with category achievement on the WCST. Multiple regression analysis including age, REI, minimum oxygen saturation, ESS, hypertension, and diabetes mellitus revealed that hypertension was the most significant factor for percentage of correct answers on the 1-back tasks. There were no significant correlations between the REI or ESS and the parameters of WCST or N-back tasks.
Conclusion: Hypertension and SDB may negatively affect cognitive function in older adults. Our findings suggest that the appropriate management of hypertension and SDB is important in mid- and late-life.
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0457

ALTERED FUNCTIONAL CONNECTIVITY OF THE ASCENDING RETICULAR ACTIVATING SYSTEM IN OSAS WITH LOW AROUSAL THRESHOLD

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Introduction: A low arousal threshold (LAT) is a pathophysiological trait of obstructive sleep apnea (OSA) that may be associated with ascending reticular activating system (ARAS)-cortical functional connectivity (FC) changes. We evaluated resting-state FC between the brainstem ARAS nuclei and 105 cortical/subcortical regions in OSA patients with or without a LAT and healthy controls.
Methods: Twenty-five patients with moderate to severe OSA with an apnea-hypopnea index between 20 and 40/hr (15 with and 10 without a LAT) and 15 age- and sex-matched controls were evaluated. Participants underwent functional magnetic resonance imaging after overnight polysomnography. Three ARAS nuclei—the locus coeruleus (LC), laterodorsal tegmental nucleus (LDTg), and ventral tegmental area (VTA)—associated with OSA in our previous study were used as seeds.
Results: FC values of the two ARAS nuclei (LC and LDTg) significantly differed among the three groups. FC of the LC with the precuneus was stronger in OSA patients than in controls regardless of the concomitant LAT. FC between the LDTg and the posterior cingulate cortex (PCC) was also stronger in OSA patients regardless of the LAT. Moreover, OSA patients without a LAT showed stronger LDTg-PCC FC than those with a LAT (post hoc p=0.013), and this FC was negatively correlated with the minimum oxygen saturation in OSA patients (r=-0.463, p=0.023).
Conclusion: The LAT in OSA patients was associated with altered LDTg-PCC FC, which was negatively correlated with the minimum oxygen saturation. This result suggested that cholinergic activity may play a role in the LAT in OSA patients.
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0458

CRANIAL BLOOD FLOW. ARTERIOVENOUS ANASTOMOSES (AVAS) SHUNTING IN OBSTRUCTIVE SLEEP APNEA

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Introduction: To analyze our data on the effect of CPAP on vascular shunt mechanisms involving intra and extra cranial blood flow.
Methods: Daytime testing. A) Intracranial rCBF (regional Cerebral Blood Flow, Xenon133 inhalation, hemispheric mean, ml/100 mg/minute). During rCBF for the integrity of the Xenon loaded spirometer EPAP was used. B) Extracranial face blood flow, infrared imaging, at baseline, post CPAP immediate, for temperature increase (vasodilation) or decrease (vasoconstriction). Temperature change of 0.5oC is significant. The protocols were in compliance with CARE and TISEM. Participants 12. Group 1: Intracranial. Seven (2 OSA patients, 5 nonapneic controls). Group 2: Extracranial. Five (3 OSA patients, 2 nonapneic controls).
Results: Group 1. Patient #1. PSG: 1) Pre-CPAP, 2) CPAP 10 cm 3) Post tracheostomy CPAP. AHI: 1) 83.3, 2) 98.25, 3) 0.00. SE%: 1) 70%, 2) 70%, 3) 74%. SaO2: 1) 56%. 2) 76%. 3) 90%. Pre tracheostomy EPAP 10 cm, rCBF flow increase of 4.35% Left and decrease of 0.62% Right hemisphere. Patient #2. PSG: AHI 48.5. SE 67%. SaO2 83%. CPAP 10 cm, PSG: AHI 0.00. SE 78%. SaO2 92%. EPAP 10 cm, rCBF increase 13.59% on Left. Increase 13.43% on Right hemisphere. In controls: 4 out of 5, EPAP increased rCBF by 21.43% left and increased 12.85% on the Right hemisphere. Group 2: Five (3 OSA patients on home CPAP and 2 non apneic controls). All given CPAP for 15 minutes. Patient #1. AHI moderate to severe. ETCO2: Baseline 37, CPAP 38 mm Hg. CPAP 12.5 cm caused face vasoconstriction. Patient # 2. AHI 63. ETCO2: Baseline 41 and during CPAP was 40. CPAP 15 cm caused face vasoconstriction. Control: Controls CPAP 10 cm caused face vasoconstriction. ETCO2 Baseline: 34 and during CPAP was 35.
Conclusion: In obstructive sleep apnea patients and controls: EPAP increased Intracranial blood flow. CPAP decreased external carotid/face blood flow/ vasoconstriction i.e., closing of AVAs- microvascular shunts. The term microcirculation applies to blood vessels smaller than 300 µm. Infrared technology images the effect of CPAP on extracranial/face blood flow in obstructive sleep apnea. This has clinical research applications.
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0459

RESTRICTION OF BREATHING IN OSA DOES NOT AFFECT SLEEP SPINDLE DENSITY

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Introduction: Obstructive sleep apnea (OSA) is associated with major neurocognitive sequalae including impaired memory. OSA patients are deficient in NREM sleep spindles (11 Hz to 16 Hz electroencephalography (EEG) sigma oscillations) which have been shown to promote memory. This finding is a result of less time spent in deeper sleep states in which most spindles occur but also a reduction in spindle density, particularly during the later portion of the night. We tested the hypothesis that spindle density deficiencies are driven by restriction of breathing preventing spindle generation.
Methods: 109 adults (ages 65-83, 53% female) with normal cognition underwent overnight polysomnography (PSG). Presence of sleep apnea was defined using AASM recommended criteria (apnea-hypopnea index >15, n=81[OSA] vs 28[controls]). The right occipital channel EEG was bandpass filtered between 0.3-35Hz. Following rejection of movement artifacts, spindles were detected in NREM sleep stages 2 and 3 (N2/N3) using complex demodulation to extract high sigma activity signals from background sigma noise. Spindles were classified depending on whether the patient was in eupnea or apnea-hypopnea.
Results: Overall spindle density in OSA patients did not differ from overall spindle density in controls (2.86 vs 3.17 spindles/minute, t(57.4)=0.49, p=0.14). Apnea-hypopnea spindle density in OSA patients did not differ from eupnea spindle density in controls (3.10 vs 3.17 spindles/minute, t(70.8)=0.31, p-value=0.76). Eupnea spindle density in OSA patients was significantly lower than eupnea spindle density in controls (2.57 vs 3.17 spindles/minute, t(54.4)=2.94, p-value< 0.01).
Conclusion: Contrary to our hypothesis, sleep spindle density was not reduced in OSA patients during apnea-hypopnea compared to healthy controls during eupnea, suggesting restriction of breathing does not affect spindle generation, but was reduced in OSA patients during eupnea. Whilst we did not observe an overall OSA-related spindle density deficit, our results suggest that previous findings of lower spindle density in OSA patients may in fact result from changes in spindle behaviour during eupnea. This observation raises the interesting possibility that using OSA interventions to prevent apnea-hypopnea occurring may not recover normal spindle density. Alternatively, our results could suggest that undetected N2/N3 sleep disruptions are occurring when OSA patients are breathing, skewing eupnea spindle density estimates.
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0460

DOSE-RESPONSE RELATIONSHIP BETWEEN THALAMIC ACTIVITY DURING SUSTAINED ATTENTION AND EXCESSIVE DAYTIME SLEEPINESS

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Introduction: Obstructive sleep apnea (OSA) is characterized by sleep fragmentation and intermittent hypoxia. Both are known causes of sleepiness and poor sustained attention, i.e., lapses in vigilance, which can be measured using the psychomotor vigilance test (PVT). Crucial to vigilance, the thalamus plays a key role by regulating sensory information essential for sustaining attention. However, to date, the relationship between thalamic activity underlying PVT and its relationship to sleepiness in OSA has not been investigated systematically.
Methods: A total of 5 newly diagnosed OSA subjects (mean AHI4% = 51±24, 5M, age 42±3 yrs., ESS [Epworth Sleepiness Scale] 11 ± 3.4), 3 healthy controls (1M/2F, age 35±2 yrs., ESS 3±3) and 9 PAP treated OSA subjects (diagnostic AHI4% = 15±12, 6M/3F, age 57±10 yrs., ESS 8±5) who demonstrated >4 hours nightly PAP adherence were studied. Participants performed a PVT during fMRI after an in-lab nocturnal polysomnography. Each fMRI session consisted of 4 runs: two PVT runs interleaved with two control runs. Analyses in AFNI were restricted to the bilateral thalamus with percent signal change used as the primary metric of thalamic activity.
Results: There was a dose response relationship of ESS to thalamic activity during PVT such that subjects with lowest levels of sleepiness (ESS) exhibited the greatest thalamic activity: untreated OSA (3±2%), CPAP treated OSA subjects (7.2±1.9%), healthy controls (21.8±1.1%); $\chi 2(3) = 7.13$, $p < 0.05$. CPAP treated OSA subjects with persistent sleepiness (ESS≥10) exhibited lower thalamic activity than those without persistent sleepiness (ESS< 10), however it did not reach statistical significance (5.3±3.4% vs. 6.9±2.9%).
Conclusion: Based on the collected data, the thalamic activity underlying PVT shows a dose response relationship with level of sleepiness. The lower degree of thalamic activity in CPAP treated patients with persistent sleepiness as compared to those without suggesting a level of irreversible injury to the thalamus due to OSA. Our findings should be further validated with a larger sample size with varying degrees of sleep apnea severity.
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0461

PARIETAL EEG SLOW ACTIVITY DURING NREM IS ASSOCIATED WITH OVERNIGHT SPATIAL MEMORY PERFORMANCE IN CPAP-TREATED OSA

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Introduction: Sleep disturbance from obstructive sleep apnea (OSA) impairs overnight memory processing which may be mediated by changes to slow wave sleep. Indeed, reduced region-specific EEG slow activity during non-REM sleep has been associated with worse overnight declarative, motor and spatial memory. Using a polysomnologically (PSG)-verified model of SWS-specific CPAP-withdrawal to create three conditions of 1) stable-SWS on CPAP, 2) SWS-fragmentation with intermittent hypoxemia (OSAsws), and 3) SWS-fragmentation with reduced hypoxemia (OSAsws+O2), we investigated whether CPAP withdrawal during SWS induces acute changes in EEG slow wave activity that is associated with overnight spatial navigational memory performance.

Methods: 19 channel EEG, re-referenced to average mastoids from 72 PSGs in 24 CPAP-adherent patients (7 female, average age 56yrs) with moderate-to-severe OSA was inspected visually for artifact removal prior to analysis using an automatic algorithm (DETOKS) for detection of relative slow wave (0.5-4Hz, SWA) and slow oscillation (0.6-1Hz, SOA) activity. During each PSG visit, participants explored one of three 3D maze environments, performing 3 timed trials before and after each of 3 randomized and counterbalanced SWS disruption conditions, 1)CPAP, 2)OSASWS & 3)OSASWS+O2. Frontal (Fz), central (Cz) and parietal (Pz) relative SWA, SOA and overnight change in maze completion times were compared according to PSG condition using Friedman Rank Sum and Conover's tests. The relationship between SWA and maze performance was tested using Pearson's correlation coefficient.
Results: No significant differences were observed between the three conditions for non-REM EEG slow activities or overnight change in maze completion times. In the CPAP condition only, greater EEG slow activity at Pz (SWA, r=0.57, p=0.01 and SOA, r=0.67, p=0.002) was associated with larger improvements in overnight maze completion times.
Conclusion: EEG slow wave activity and maze performance were not influenced by the recapitulation of OSA during SWS in CPAP-treated individuals. There was, however, a positive relationship between parietal-specific EEG slow oscillation activity and overnight maze performance during stable CPAP-treated slow wave sleep. These observations suggest that OSA of sufficient severity to impact SWA or SOA may negatively impact spatial navigational memory, but the selective withdrawal of CPAP in SWS only was not sufficient to do so.
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0462

POLYSOMNOGRAPHIC BIOMARKERS OF SLEEP DISRUPTION AND INCIDENT MIGRAINE IN A LARGE CLINICAL COHORT

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Introduction: The relationship between sleep disruption characterized by polysomnography and migraine development remains unclear. This study elucidates this association, examining whether indices of sleep disturbance could serve as predictors of migraine.
Methods: In this longitudinal study, 132,705 participants (2000 to 2023) without pre-existing migraines were analyzed. Predictors included Apnea-Hypopnea Index (AHI), Mean SaO2, arousal index, and Epworth Sleepiness Scale (ESS) scores. Covariates for adjustment comprised age, sex, body mass index (BMI), race, neck size, end-tidal CO2, sleep stage percentages, and household income. Migraine incidence was ascertained using ICD diagnosis codes. Analysis employed univariable and multivariable Cox regression models.
Results: The cohort averaged 50.2 ± 19.0 years, was 54% male, and 76% Caucasian. Mean follow-up was 4.8 ± 4.1 years until migraine incidence. Adjusted regression showed higher AHI (per 5 units) was associated with a 1% reduction in migraine risk (HR=0.989, 95% CI 0.986-0.992). Also, higher mean SaO2 predicted a 4% increase in migraine incidence (HR=1.04, 95% CI 1.03-1.06). Reduced N1 percentage (HR=0.993, 95% CI 0.988-0.999), lower arousal index (per 1 unit, HR=0.993, 95% CI 0.991-0.996), and higher income (per $10,000, HR=0.96, 95% CI 0.94-0.98) also decreased migraine development. However, elevated ESS scores (HR=1.04 per unit increase) and larger neck sizes (HR=1.005 per 1 cm) augmented migraine risk (both p< 0.001).
Conclusion: More severe sleep disruption correlated with reduced migraine incidence, contrasting expectations. Apnea-induced vasoconstriction may trigger protective vascular changes in calcitonin gene-related peptide (CGRP)/serotonin pathways. Further study on mediating mechanisms is warranted.
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0463

SLEEP DISRUPTION AND LONGITUDINAL COGNITIVE AGING

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Introduction: Aging is often accompanied by sleep disturbances and cognitive impairment. However, the relationship between specific sleep parameters and cognitive decline remains unclear. This study investigates the longitudinal association of objective measures of sleep disruption including sleep architecture and hypoxia in relation to levels of cognitive function, as ascertained by the Montreal Cognitive Assessment (MoCA) scores. We hypothesize that certain sleep characteristics, including degree of hypoxia, significantly influence cognitive aging trajectories.
Methods: This study involved an analysis of patients with mild cognitive impairment (MCI) in Alzheimer's Disease (AD) between 2011 and 2023. The main predictor variables were various sleep study parameters, including the Apnea-Hypopnea Index (AHI), mean SpO2 levels, arousal index, and sleep stage percentages. Covariates in the analysis were sex and age. To assess cognitive function, we used the MoCA which is a comprehensive tool scoring (range 0-30; assesses visuospatial, executive function, memory, attention, etc.), where higher scores indicate better cognitive function. Our statistical approach involved multivariable linear mixed models, adjusted for the covariates, to evaluate the MoCA scores over time (-1 to +3 years from sleep study) with sleep parameters.
Results: The study included 275 patients with MCI-AD, across 816 observations with an average age of 69.6 ± 8.7 years. Among them, 65.1% were male, 85.1% white with median 16 (IQR:12-17) years of education. Over 21 months mean follow-up among those with repeat MoCA testing, scores declined by -0.06 points/month (95% CI -0.08, -0.04; p< 0.001). A significant finding was the association of higher mean oxygen saturation with a more rapid cognitive decline, at -0.10 points per month for each 1% increase in oxygen levels (95% CI -0.19, -0.01; p=0.033). Other sleep measures including sleep architecture showed no significant associations with MoCA score changes.
Conclusion: This study sheds light on the intricate relationship between sleep quality, oxygen saturation, and cognitive aging. Our findings reveal a novel association between higher sleep-related oxygen saturation levels and accelerated cognitive decline in MCI-AD patients is biologically plausible given reports of altered EEG activity with task-evoked potentials in response to

hyperoxia. Future investigation should clarify effects of hyperoxia on neural activity and oxidative stress in neurodegeneration.
Support (if any):

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0464

THE IMPACT OF FATIGUE AND SLEEPINESS ON PATIENTS WITH OSA: A CLOSER LOOK WITH PATIENT REPORTED OUTCOME MEASURES

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Introduction: Qualitative interviews were conducted to understand experiences of individual with OSA by evaluating the content validity and relevance of 5 patient reported outcome (PRO) measures (PROMIS-Fatigue-8a, the PROMIS-Sleep Impairment-8a, the Epworth Sleepiness Scale (ESS), Patient-Global Impression of Severity (PGI-S)-Fatigue, and Patient-Global Impression of Change (PGI-C)-Fatigue).
Methods: 3 US sites identified individuals with OSA. Once consented, participants completed an interview containing concept elicitation and cognitive debriefing questions. Interviews were recorded, transcribed, and analyzed using qualitative software. Symptoms and impacts were mapped to the PROs, and a gap analysis was conducted. The study was approved by WCG IRB.
Results: 30 individuals with OSA (20 current non-PAP users [mean age=55; 50% male] and 10 current PAP users [mean age=52, 80% male]) were interviewed. Non-PAP and PAP users viewed fatigue and feeling sleepy as separate, distinct symptoms. Among non-PAP users the most common symptoms were fatigue (100%), difficulty concentrating (85%), feeling sleepy (75%), dry mouth (60%), interrupted sleep (50%), and headaches (50%). Fatigue (63%) was most bothersome, while 5% rated feeling sleepy as most bothersome. Among PAP users the most common symptoms were fatigue (100%), feeling sleepy (90%), difficulty concentrating (60%), dry mouth/throat (60%), headaches (50%), and interrupted sleep (50%). Fatigue (63%) was most bothersome, while 25% rated feeling sleepy as most bothersome. Non-PAP and PAP users reported negative impacts on daily activities (50% both), physical (60% and 50%, respectively), social (50% both), and emotional functioning (80% and 60%), and relationships (75% and 70%). Impacts on ability to work for pay and work productivity (45% and 70%) were also common. PAP users reported improvements on their ability to do daily activities (80%) and all areas of functioning after initiating PAP (range: 80-100%). In general, participants found these PROs to be clear and appropriate. Fatigue and sleepiness were two of the most common symptoms cited; these concepts are comprehensively covered by these PROs.
Conclusion: Fatigue and sleepiness should both be assessed in OSA trials and clinical practice. This study provides evidence to support the content validity, clarity, and relevance of the PROMIS-Fatigue-8a, PROMIS-Sleep Impairment-8a, ESS, PGI-S-Fatigue, and PGI-C-Fatigue PROs in an adult OSA population.
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0465

INCREASED ALL-CAUSE MORTALITY AND ASSOCIATED FACTORS IN KOREAN OSA PATIENTS

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Introduction: Obstructive sleep apnea (OSA) has been known to be associated with increased cardiovascular, metabolic diseases and mortality. As few studies reported associated factors on relationship between OSA and mortality, we aimed to investigate all-cause mortality and associated factors in OSA patients.
Methods: We performed retrospective study in group of 1547 subjects who referred to the Center for Sleep and Chronobiology, Seoul National University Hospital, from June 2004 to December 2013. Subjects who had other sleep disorders including parasomnia, restless legs syndrome, possible periodic limb movement disorder (PLMI>15), narcolepsy, etc were excluded (N=331) and a total of 1216 subjects was included for analysis. Deaths out of final subjects that occurred up to December 31, 2020 from Statistics of Korea, the national bureau of statistics were examined. We divided subjects into four groups: no-sleep disorder (N=276, AHI< 5), mild (N=268, 5≤AHI< 15), moderate (N=275, 15≤AHI< 30) and severe OSA groups (N=397, AHI≥30). We employed cox proportional hazard regression analysis to estimate hazard ratios (HRs) against no-sleep disorder and 95% confidence intervals adjusted for age, sex, hypertension, diabetes, dyslipidemia and longest apnea duration on polysomnography.
Results: HR of all-cause mortality was increased in the severe, moderate and mild OSA groups (HR=5.515, 95% CI=1.337-22.425, p-value=0.017, HR=5.443, 95% CI=1.555-19.054, p-value=0.008, HR=4.179, 95% CI=1.305-13.382, p-value=0.016, respectively). Longest apnea duration showed a significant association with decreased mortality (HR=0.955, 95% CI=0.932-0.979, p-value< 0.001). Age was associated with increased mortality (HR=1.103, 95% CI=1.071-1.136, p-value< 0.001). However, sex, diabetes, hypertension and dyslipidemia showed no significant association with mortality (All p-values > 0.05).
Conclusion: Current results suggest increased mortality in patients with OSA. In particular, severity of OSA based on AHI was related with increased mortality. We found longest apnea duration was associated with decreased mortality as well. Previous notion on adverse effect of shorter apnea duration associated with frequent arousal might attribute to these results. Since CPAP compliance was not considered in this study, association between CPAP use and apnea duration also can be considered as another possible cause. We need further study to confirm the associated factors on mortality in OSA including apnea duration.
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0466

BENZODIAZEPINES AND OPIATES SHORTEN EXACERBATION-FREE TIME IN COPD PATIENTS ON LONG-TERM NON-INVASIVE VENTILATION

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Introduction: Benzodiazepines and opiates are taken by patients with very severe COPD to relieve breathlessness. There is a growing concern that these medications can depress the respiratory drive and could contribute to worsening respiratory failure. However, the relationship between exacerbation rate and medication taken is poorly understood in patients with chronic respiratory failure.
Methods: As part of a retrospective service evaluation project, we analysed 383 patients with COPD (pre-setup 64±9 years, 143 men, FEV1 38.1±15.9 %pred, mMRC 3.7±0.6, 3 /2-5 interquartile range/ exacerbations/year, capillary blood pH 7.39±0.08, pO2 7.9±1.6 kPa, pCO2 8.2±2.1 kPa) who were established on long-term non-invasive ventilation at our tertiary centre. We analysed associations with medication usage, pre-setup overnight and daytime gas exchange as well as symptoms and pre- and post-setup annualised exacerbation rate.
Results: Seventy-seven patients took benzodiazepines (0.65±0.58 mg/day clonazepam equivalent), 185 patients took opiates (34.1±42.6 mg/day morphine equivalent). Neither benzodiazepine nor opiate usage was associated with overnight hypoxaemia (as measured by oxygen desaturation index or time spent with saturation below 90%), daytime hypercapnia, hypoxia or the number of annual exacerbations before NIV setup. The mMRC scores were higher in patients taking both benzodiazepines (3.9±0.2 vs. 3.7±0.7, p=0.02) and opiates (3.9±0.4 vs. 3.6±0.7, p< 0.01) compared to those who did not. Long-term NIV significantly reduced the number of yearly exacerbations in this cohort (from 3 /2-5/ to 2 /1-5/, p< 0.05). However, the time to the next exacerbation post-NIV setup was shorter in patients who took benzodiazepines (5.7±8.9 vs. 6.5±7.4 months, p=0.04) and opiates (4.4±6.2 vs. 6.2±8.7 months, p=0.03).
Conclusion: Benzodiazepines and opiates are commonly taken in this cohort, especially in those with a high symptom burden. Whilst they do not seem to contribute to impaired gas exchange or exacerbation rate pre-setup, they may limit the benefit of long-term NIV in reducing exacerbation rate.
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0467

EFFECT OF HYPOXIA ON VENTILATORY RESPONSIVENESS IN OPIOID-RELATED SLEEP DISORDERED BREATHING

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Introduction: Ventilatory control mechanisms mediating opioid-associated sleep disordered breathing (SDB) are unclear, with reduced hypoxic ventilatory response (HVR) observed acutely with opioids, but increased HVR with chronic methadone use. Increased chemoresponsiveness may contribute to breathing instability during sleep. Aim: Determine the effects of chronic oral prescription opioids on HVR in individuals with opioid-associated SDB. Hypothesis: Compared to controls without opioid use, individuals with chronic prescription opioids-associated SDB will have increased HVR during wakefulness.
Methods: We studied 5 males on prescription opioids with SDB (age: 55±15 years, BMI: 33±7 kg/m2, apnea hypopnea index (AHI): 30±24/hr; CAI 3±6/hr, morphine equivalent dose: 31±12 mg , serum opiate levels: 23±22 ng/ml), and 5 control males with SDB, not on opioids, (age: 48±11 years, BMI: 28±2 kg/m2, AHI 37±15/hr, CAI 0.2±0.5/hr; urine drug screen negative for opioids). Opioid-SDB and controls underwent multiple trials with exposure to 2-minute episodes of isocapnic hypoxia (Hypoxia PetO2: 5-7%), each trial interspersed with room air, during wakefulness. Isocapnia was maintained by bleeding in CO2. Number of hypoxia (Hx) trials: opioid-SDB: 8.2±1.3; controls 7.0±0.7. All ventilatory parameters were analyzed breath by breath. For each trial, the ventilatory parameters during hypoxic exposure were compared with the room air baseline period immediately preceding the exposure. HVR was calculated as the change in minute ventilation during nadir hypoxia compared to control breaths for a corresponding change in PetO2.
Results: Minute ventilation (VI) during hypoxia trial was 99.1±28.5% of baseline Vi in opioid-SDB vs. 105±16% baseline Vi in control participants. The coefficient of variation of Vi was 29% in opioid-SDB vs. 15% in control-SDB (p=0.05). Opioid-SDB: PetCO2 37±4 mmHg at baseline and 37±3 mmHg during Hx trials; Control: PetCO2 37±4 mmHg at baseline and 41±3 during Hx trials. Opioid-SDB: PetO2 100±6 mmHg at baseline and 33±6 mmHg during Hx trials; Control: PetO2 101±5 mmHg at baseline and 46±7 during Hx trials. HVR: 0.6±2.4 L/min/mmHg vs. 1.4±4.2 L/min/mmHg in opioid-SDB vs. controls.
Conclusion: HVR tended to be reduced in opioid-SDB vs. controls during wakefulness. There was variability in minute ventilation in opioid users. Additional studies in a larger sample are required to delineate hypoxic ventilatory responsiveness in opioid-SDB.
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0468

CRASH: CANCER REOCCURRENCE IS ACCELERATED BY EPISODIC HYPOXEMIA

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Introduction: Several studies have shown a positive association between Obstructive Sleep Apnea (OSA) and malignancies such as lung cancer. However, the effects of intermittent hypoxemia in cancer-free survival following curative therapy are not known. We propose that OSA-related episodic hypoxemia and hypoxic burden are independent risk factors for accelerated lung cancer reoccurrence (< 2 years).
Methods: We performed a retrospective record review of patients 18 years and older from January 2016 to September 2023 with history of non-small cell lung cancer who received an overnight oximetry study (OXY) within three years prior to undergoing curative malignancy treatment. Subjects with history of central sleep apnea, baseline oxygen saturation (SpO2) below

90%, receiving supplemental oxygen or treatment for OSA were excluded.
Results: 403 patients met inclusion criteria (52% female vs 48% males; median age 74 y). The most common histologic subtypes were adenocarcinoma (68%) followed by squamous cell carcinoma (22%). Most patients fell into Stage IA1 (35%) followed by IA2 (24.1%) and IB (19%) as per TNM 8th edition classification. Over this period, 68 patients (22%) had lung cancer recurrence (median 19 months). A 4% oxygen desaturation index (ODI) of >15 and time spent in desaturation events were found to be a risk factor for cancer reappearance in less than 2 years ($p< 0.001$). Measures of hypoxic burden such as time spent below 89% SpO2, average SpO2 value below 89%, and single nadir oxygen levels, showed a similar association ($p< 0.001$). This was irrespective of histologic subtype, stage at diagnosis, and all studied demographic variables. Basal SpO2 demonstrated no correlation. A multivariate proportional hazard survival model showed that ODI>15 was no longer significant, however average SpO2 below 89% and single minimum oxygen level remained strongly correlated with accelerated recurrence.
Conclusion: This study showed a strong, positive association between accelerated lung cancer recurrence and OSA-related episodic hypoxemia and hypoxic burden on our univariate analysis. The multivariate model demonstrated correlation with hypoxic load measures only, suggesting the need for a larger sample to elucidate the involvement of this highly treatable risk factor. To our knowledge, this is the first study revealing this potential link.
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0469

ON-ROAD DRIVING PERFORMANCE THE MORNING AFTER BEDTIME SELTOREXANT IN MAJOR DEPRESSIVE DISORDER AND HEALTHY ELDERLY

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Introduction: Seltorexant, a potent and selective orexin-2 receptor antagonist is being developed as an adjunctive treatment for major depressive disorder (MDD). On-road driving performance was evaluated in adults and elderly with MDD taking an antidepressant (SSRI/SNRI) and in healthy elderly participants following bedtime administration of seltorexant.
Methods: This was a randomized, double-blind, placebo- and positive-controlled 4 way crossover study in 37 adults with MDD taking an antidepressant (SSRI/SNRI) and 26 elderly participants (n=19 with MDD; n=7 healthy). Study treatments were administered at bedtime for eight consecutive days: 2 dose levels of seltorexant (20-or 40-mg), zopiclone 7.5-mg on Days 1 and 8, or placebo. Driving performance was assessed on days 2 and 9 (9h post-dose) using a 1-hour standardized highway driving test (~100 km) in normal traffic, measuring standard deviation of lateral position (SDLP, weaving of car). Drug–placebo difference in SDLP of ≥2.4 cm was considered to reflect clinically meaningful driving impairment.
Results: Mean SDLP differences between drug and placebo following seltorexant 20-mg and 40-mg on days 2 and 9 were very small and the upper limits of the 2-sided 95%CI were below the threshold of 2.4 cm (least-square mean [95%CI] 20 mg: −0.1 [−0.80, 0.57] cm, Day 2; −0.2 [−0.81, 0.46], Day 9; 40-mg: 0.4 [−0.27, 1.12], Day 2; 0.6 [−0.14, 1.25], Day 9), suggesting no clinically relevant changes in driving performance in adults and elderly with MDD. Similar results for SDLP were noted for other populations (adults with MDD, elderly, all participants). Assay sensitivity was demonstrated using the positive control, zopiclone, which caused impaired on-road driving performance as measured by the SDLP (least-square mean [95%CI] Day 2: 2.8 [1.99, 3.59] cm, Day 9: 2.7 [1.76, 3.60] cm; lower limits of the 2-sided 95% CI were >0 cm). Most TEAEs were mild or moderate in severity and no new safety issues emerged.
Conclusion: Seltorexant 20-mg and 40-mg administered as single and multiple doses had no clinically meaningful negative effects on next morning driving performance in adults and elderly with MDD taking an antidepressant (SSRI/SNRI) and healthy elderly participants as assessed by mean changes in SDLP relative to placebo.
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0470

REAL-TIME DATA SHOWING IMMEDIATE IMPROVEMENT OF OBSTRUCTIVE SLEEP APNEA FOLLOWING RENAL TRANSPLANT

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Introduction: There is a well-documented correlation between end stage renal disease (ESRD) and obstructive sleep apnea (OSA). Prevalence of OSA in the ESRD population has been show to be as high as 51%. There is a complicated interrelation between the two pathologies. Hypertension, is a major contributing factor to the progression chronic kidney disease and subsequently ESRD. It is a consequence of the cascade of increased sympathetic tone, vasoconstriction, and oxidative stress caused by the hypoxic episodes of OSA. Volume overload and fluid shifts during recumbence leads to an increase in tissue fluid around the upper airway in patients with ESRD and has been shown to worsen OSA4. Data on improvement in OSA after renal transplantation has been mixed, with some case reports of OSA resolution after transplantation, but a greater number of studies showed no significant improvement of OSA following transplantation. Most studies review long term SDB in relation to transplant, few studies measure sleep disordered breathing in the immediate post-op period
Methods: Our patient is a 54-year-old African-American male with ESRD secondary to systemic lupus erythematosus on HD since 2017. He had been treated with methotrexate, hydroxychloroquine, mycophenolate mofetil, and corticosteroids prior to transplant. Medical history other than the above includes rheumatoid arthritis, pericarditis, hypertension, osteoporosis, and OSA treated with CPAP. The patient had been compliant with CPAP prior to transplant. OSA was diagnosed in 2014 with AHI of 26.1 events/ hour, with a nadir Sao2 of 60%.
Results: He underwent deceased donor renal transplant on 11/11/2018. During this hospitalization he was using his home CPAP, which recorded his compliance and treatment data. Evaluation of his downloaded CPAP compliance report revealed a dramatic improvement in respiratory events starting the day of

transplant. AHI improved from 0.6 events/hour to 0.2 events/hour immediately following transplant.
Conclusion: Although recent studies have not shown resolution of obstructive sleep apnea in ESRD patients following transplantation, this case does show a dramatic improvement in the degree of sleep-disordered breathing immediately following surgery. This case also provides real time data regarding the effects of renal transplantation on sleep disordered breathing.
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0471

SIMPLIFIED ENDOTYPING USING HOME SLEEP STUDY DATA TO INFORM TARGETED THERAPY FOR OBSTRUCTIVE SLEEP APNEA

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Introduction: Obstructive sleep apnea (OSA) pathogenesis is heterogenous with important contributions from at least 4 key endotypes: 1) impaired pharyngeal anatomy, 2) unstable breathing control (high loop gain), 3) poor pharyngeal dilator muscle responsiveness and 4) waking up too easily to minor airway narrowing (low respiratory arousal threshold). Gold standard physiology assessments in a relatively small number of well-characterized participants indicate wide interindividual variability in pharyngeal collapsibility (impaired upper airway anatomy) and that ~30% of people with OSA have impairment in each of the three non-anatomical endotypes. Overall, ~70% have impairment in one or more non-anatomical endotypes which has implications for targeted therapy decisions. We recently developed a simplified model to estimate OSA endotypes from standard in-laboratory polysomnography and clinical data (Dutta et al, Annals ATS, 2021). In this study, we applied this model to estimate OSA endotypes in a large clinical population.
Methods: OSA endotypes were estimated using standard sleep study outputs and clinical data (i.e., age and BMI) from >6,500 consecutive home-based diagnostic studies (Sleep Profiler PSG-Advanced Brain Monitoring). All participants had an apnea/hypopnea index (AHI) >5 events/h. The proportion of participants who were estimated to have impairment in one or more OSA endotypes was calculated according to previously published physiological cutoffs.
Results: On average, participants (39% female) had moderately severe OSA (AHI=28±23 events/h ([Mean±SD]), were middle aged (49±15 years) and obese (BMI=32±7 kg/m2). 29% were estimated to have only mild anatomical compromise (Pcrit< -2cmH2O). 23% had poor dilator muscles, 31% high loop gain and 29% had a low arousal threshold. 62% of participants had impairment in one or more non-anatomical endotypes.
Conclusion: These data highlight the feasibility for simplified OSA endotyping using home sleep study recordings at scale. In addition, consistent with smaller, more detailed physiology studies, a substantial proportion of the clinical OSA patient population have only minor anatomical impairment. Furthermore, approximately two thirds have impairment in one or more non-anatomical endotypes. These findings highlight the potential for simplified OSA endotyping to inform targeted non-CPAP therapy selection for a large proportion of people diagnosed with OSA.
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0472

ASSOCIATION OF U.S. MILITARY BURN PIT SMOKE EXPOSURE WITH POLYSOMNOGRAPHY EXTRACTED OXYGEN SATURATION

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Introduction: Burn pits (BPs) have been widely utilized by the U.S. military for waste disposal. Due to toxic nature of the BP emissions, exposure may contribute to adverse health conditions, including nocturnal breathing problems. This study aimed to examine the association between self-estimated amount of BP emission exposure and oxygen (O2) levels during sleep.
Methods: Using polysomnography reports in the Veteran Affairs electronic medical records, oxygen saturation (SaO2) measures were extracted for 4940 Veterans and active-duty personnel (age 39.7±9.2 y, BMI 29.3±4.6 kg/m2, 16% female, 66% white) registered on the VA/DoD Airborne Hazards and Open Burn Pit Registry. Outcomes included nadir and mean SaO2. Cumulative BP exposure (BPe) variable was calculated by multiplying the response (in hours) to a question about burn pit exposure by number of deployment days, summing across deployments, and categorized into quartiles by ranking (Q1-Q3, with Q0 as reference). Inverse probability treatment weighing method was used to adjust the imbalances of covariates age, BMI, sex, race, ethnicity, military branch, and duty status between treatment groups. We performed separate weighted logistic regression models to determine the association between cumulative BPe days and SaO2 (≤90%). Additional analyses were performed on current smoking subgroup.
Results: We observed higher odds of nadir (OR:1.2, p=.045) and mean (OR:1.29, p<.0001) SaO2 in prolonged BPe quartile (Q3). Subgroup analyses revealed similar findings as prolonged BPe quartile in current smokers predicted higher odds of nadir (OR:1.69, p=0.02) and mean SaO2 (OR:1.97, p=.0003)
Conclusion: Higher levels of BP emission exposure was associated with lower oxygen saturation during sleep. Compared to former and never smokers, veterans with current smoking status and higher BPe had significant lower SaO2. Hence, smoking may exert a synergistic effect with BPe on nocturnal SaO2.
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0473

HOMOCYSTEINE AS A PREDICTOR OF APNEA-HYPOPNEA INDEX IN OBSTRUCTIVE SLEEP APNEA: LONGITUDINAL EPIDEMIOLOGICAL STUDY

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Introduction: Obstructive sleep apnea (OSA) affects nearly 1 billion people globally, and has established links with cardiovascular and neurocognitive complications. Although it has some limitations, the apnea-hypopnea index (AHI) is commonly used to gauge OSA severity and therapeutic response. Our objective was to investigate homocysteine (Hcy) levels as a predictor of AHI values and as a risk factor for OSA.
Methods: This is a prospective longitudinal cohort study with 8 years follow-up based on a subsample of the São Paulo Epidemiological Sleep Study (EPISONO). Data from polysomnography and blood analysis were used, data from the AHI and plasma Hcy, cobalamin and folic acid levels were extracted from dataset. The generalized estimation equation was used to estimate the predictive value of Hcy levels, and logistic regression was performed to estimate the risk.
Results: Our findings showed that Hcy was a predictor for an increased AHI, and AHI increased over time. Individuals with plasma Hcy levels ≥15 µmol/L experienced an average AHI increase of 7.43 events/hour ([beta coefficient] β=7.43; 95%CI: 2.73 to 12.13) over time, compared to those with plasma levels < 10 µmol/L. A similar trend was apparent in those with plasma Hcy levels between 10≥ to < 15 µmol/L, who had an AHI increase with an average beta coefficient of 3.20 events/hour (95%CI:1.01 to 5.39) compared to those with plasma Hcy levels < 10µmol/L. Our results revealed that increased plasma Hcy levels could be considered a risk factor for the development of OSA. Those with higher plasma Hcy levels have a greater risk of developing OSA (odds ratio=1.098 95%CI: 1.022 to 1.181).
Conclusion: In conclusion, the results suggest that plasma Hcy levels can predict the severity of OSA, highlighting their association with AHI.
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0474
THE IMPACT OF NECK CIRCUMFERENCE AND BODY MASS INDEX ON UPPER AIRWAY COLLAPSIBILITY

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Introduction: Drug-induced sleep endoscopy (DISE) is the most commonly utilized diagnostic tool for determining sites of upper airway collapse in patients with obstructive sleep apnea (OSA) seeking alternative treatments to continuous positive airway pressure (CPAP). Drug-induced sleep endoscopy with positive airway pressure (DISE-PAP) is a new technique that allows for both the qualitative visualization of upper airway collapse as well as a quantitative measure of collapsibility. In this study, we sought to determine if the anatomic features of neck circumference and body mass index (BMI) impact the degree of upper airway collapsibility, also known as the pharyngeal opening pressure (PhOP), during DISE-PAP.
Methods: This was a retrospective, consecutive cohort study of adult sleep surgery patients referred to a CPAP-alternatives clinic and evaluated by a single, experienced sleep surgeon at a tertiary care center from July 2021 to September 2023. Inclusion criteria were adults greater than 18 years of age with a history of OSA (apnea hypopnea index > 5) and a history of CPAP-intolerance. All patients underwent DISE-PAP in a standardized fashion as previously described by the senior author. The primary outcome sought to determine the relationship between neck circumference and the degree of upper airway collapsibility (PhOP), while the secondary outcome evaluated the relationship between BMI and PhOP.
Results: 97 patients were included for neck circumference and 264 patients were included in analysis of BMI. On average, the cohort was middle-aged, obese (BMI 30.3), male (70.5%), White (64.8%), and with moderate-severe obstructive sleep apnea (AHI 33.3). In terms of our primary hypothesis, a mild positive correlation was observed between neck circumference and PhOP (Spearman correlation coefficient = 0.310, p = .002). In regards to our secondary hypothesis, a mild positive correlation was observed between BMI and PhOP (Spearman correlation coefficient = 0.237, p = 0.0001).
Conclusion: This study found a weak but statistically significant correlation between both neck circumference and BMI and the degree of upper airway collapsibility. These findings contribute to the current understanding of the impact on neck circumference and BMI on OSA. Further research is required to determine the clinical impact of these outcomes in the management of CPAP-intolerant patients.
Support (if any):

Abstract citation ID: zsae067.0475

0475
DIFFERENCES AND RISK FACTORS RELATED TO HYPOXIC BURDEN IN NON-HISPANIC BLACK/AFRICAN AND WHITE OLDER ADULTS

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Introduction: Obstructive Sleep Apnea (OSA) is as a prevalent sleep-related breathing disorder. The apnea-hypopnea index (AHI), used for the diagnosis of OSA, captures only the frequency of respiratory events and has demonstrable limitations. Measurements such as total arterial oxygen saturation < 90% (T90) and Hypoxic Burden (HB) have demonstrated utility for predicting cardiometabolic diseases, and other adverse health outcomes. Additionally, OSA has been associated with differential effects across racial/ethnic categories. In this cross-sectional study, we evaluate a community-dwelling healthy cohort of non-Hispanic Black and White older adults participating in studies on sleep, memory, and aging.
Methods: The study included a two-day clinical visit evaluation and one-night polysomnogram (PSG). Hypoxic burden was calculated as the area between the baseline and the SpO2 trace for any episode with >= 3% desaturation. Black and White older adults were relatively matched by age, gender, BMI and AHI4%. Multiple regression analyses with HB as the dependent variable

and Age, Race, Sex, HTN, AHI4%, and BMI as the independent variables, and t-test was performed for group comparisons with a p-value < 0.05 defined as significant.
Results: Of the 140 subjects, 88 (62.85%) were females, 52 (37.15%) were males, 70 (50%) were non-Hispanic Black, and 70 (50%) were non-Hispanic White. The mean age was 67 (CI=63-71) years, BMI was 25 (CI=23-32) kg/m**2, and education was 16 (CI=14-18) years. Overall, male subjects had higher HB compared to females, p<.001. A significant difference in the HB was observed between blacks and whites regardless of hypertensive status, p<.008 for all. Black males and females had higher HB than white males and females, respectively, p<.0009 for all. Furthermore, age was negatively correlated with HB and this correlation was stronger in blacks compared to whites (r=-.43 vs. r=-.38, p<.05).
Conclusion: Hypoxic burden is a better predictor of cardio metabolic effects, compared to the AHI. Our findings indicate a more pronounced impact, particularly among blacks, with factors such as sex, hypertension, and BMI influencing this association. Future studies should examine the effects of modifiable factors, and how these may contribute to these observed sex/racial differences.
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0476

SPLIT-POLYSOMNOGRAPHY PARAMETERS AND AUTO-CPAP ADHERENCE FACTORS IN HISPANIC AND NON-HISPANIC-WHITE PATIENTS

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Introduction: Studies on Hispanic patients (HP) in the US have highlighted a higher prevalence of obstructive sleep apnea (OSA) compared to non-Hispanic White patients (WP). However, the role of obesity or body mass index (BMI) as a confounding factor remains unclear. Few studies have investigated the success of titration in split-night polysomnography (PSG) and factors affecting continuous positive airway pressure (CPAP) adherence. This study aims to assess OSA severity and PSG parameters in HP vs. WP, differences in treatment during split-night PSG studies, and CPAP adherence factors during follow-up.
Methods: We conducted a retrospective clinical chart review, split-night PSG studies, and CPAP adherence on adults at the University of California, San Francisco, in Fresno, from 3/1/2023 to 9/11/2023. Participants were categorized based on self-reported ethnicity as HP or WP.
Results: The study included 50 WP (15 women, 35 men, mean age 60.5±13.60 years, mean BMI 34.2±7.48) and 45 HP (24 women, 21 men, mean age 54.9±13.06 years, mean BMI 37.3±7.88). The mean apnea-hypopnea index (AHI) in HP was 51.1±33.67, saturation nadir 77.8±10.19, and time spent with saturation < 88% was 16.9±23.50 minutes. In WP, the mean AHI was 39.2±24.49, saturation nadir 81.6±9.04, and time spent < 88% was 7±11.36 minutes. All differences were statistically significant (p< 0.05). Titration data did not vary between groups. Auto CPAP was prescribed to all patients, with adherence at 3-4 months in HP at 75%±30, usage of 5.5±2.2 hours, and residual AHI 3±3.5. In WP, adherence was 79%±30, usage 5.9±2.1 hours, and residual AHI 3.6±6.2. None of these differences were statistically significant. Among HP, 37% missed follow-up appointments compared to 12% of WP. More HP used full-face masks, while more WP used nasal masks.
Conclusion: HP exhibited significantly worse OSA parameters during the diagnostic portion of PSG than WP. However, both groups demonstrated similar treatment outcomes in the split study. HP had a significantly higher no-show percentage than WP. CPAP adherence and residual AHI were not statistically different among those with follow-up, but more HP missed follow-up appointments than WP. Mask preferences differed between groups, with HP favoring full-face masks and WP preferring nasal masks.
Support (if any):

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0477

IMPACT OF SOCIOECONOMIC DISPARITIES ON CPAP COMPLIANCE

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Introduction: Social disparities is known to have a significant impact on health outcomes including those related to obstructive sleep apnea (OSA). More recently a metric known as area deprivation index (ADI) which combines 17 social determinants of health has been used to better quantify this impact. We aim to examine the relationship between socioeconomic disparities and CPAP adherence among adults with OSA using ADI.
Methods: Retrospective chart review of patients with diagnosis of OSA and prescribed CPAP from Oct-Dec 2022. Patients were divided into more or less socioeconomically disadvantaged groups using a validated measure, the area deprivation index (ADI). 30 day CPAP compliance was collected. CPAP compliance was defined using Medicare criteria (>4hrs/night 70% of the nights). Long term CPAP data is currently being collected.
Results: 452 patients included. Patients from the most deprived areas as determined by ADI had significantly lower CPAP compliance than those from the most advantaged areas (34% compared to 56%) (p< 0.05). Patients from areas with lower rates of high school graduates had lower CPAP compliance (p< 0.05). In multivariate regression non-English speaking appeared to be a significantly negative predictor of CPAP compliance.
Conclusion: Socioeconomic disparities appear to have a significant impact on CPAP compliance. In particular, those from areas that are considered more deprived, areas with lower rates of high school graduates and non English speakers seem to be impacted the most. Patients within these groups may benefit from additional resources and/or closer follow up to improve compliance with treatment.
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0478

THE ASSOCIATION OF OBSTRUCTIVE SLEEP APNEA WITH METABOLIC SYNDROME IS MODIFIED BY AGE

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Introduction: It has been proposed that there is a bi-directional, feed forward, pernicious association between obstructive sleep apnea (OSA) and metabolic syndrome, all promoting atherosclerosis and cardiovascular disease. However, the cardiometabolic comorbidities associated with OSA tend to diminish with age. The goal of this study is to examine whether the association of OSA with MetS is modified by age.
Methods: We studied 1,741 adults from the Penn State Adult Cohort (age 20-88 years, 52.3% female, 12.4% racial/ethnic minority) who underwent a 1-night polysomnographic evaluation, clinical history, and physical examination. The presence of OSA was defined as an apnea/hypopnea index ≥15 events/hour. Outcome variables include the five MetS components as defined by the National Heart, Lung, and Blood Institute/American Heart Association modified criteria, i.e., obesity (BMI≥30 kg/m2), hypercholesterolemia (≥200 mg/dL), hypertriglyceridemia (≥150 mg/dL), diabetes (fasting glucose ≥100 mg/dL and/or treatment), and hypertension (blood pressure ≥130/85 mm Hg and/or treatment). Logistic regression models examined the association of OSA with MetS components in the entire cohort and divided by age (< 60 and ≥ 60 years) adjusting for race, sex, smoking, alcohol and sampling weight.
Results: There was a significant interaction between MetS components and age. In individuals younger than 60 years old, OSA was significantly associated with increased risk of diabetes (OR=5.619, 95%CI=2.74-11.53, p=<.001), hypertension (OR=3.85, 95%CI= 1.95-7.63, p=<.001), hypercholesterolemia (OR=5.99, 95%CI=2.36-15.21) and hypertriglyceridemia (OR=4.75,95%CI=2.30-9.90, p=<.001). There was no association of OSA and these four components of MetS syndrome (i.e., hypertension, diabetes, hypercholesterolemia and hypertriglyceridemia) in individuals 60 years or older. The association of OSA with BMI was stronger in those younger than 60 vs. those older than 60 (OR=6.03, 95%CI=3.08-11.78, p<.001 vs, 2.47, 95%CI= 1.23-4.94, p=.011, respectively).
Conclusion: The association of MetS components with OSA is strong in young and middle-aged adults, but not in older adults. These findings suggest that MetS is key to the pathogenesis of OSA in young and middle-aged adults whereas other mechanisms such as airway anatomy and collapsibility play a greater role in older adults. This suggest different treatment strategies may be needed for this highly prevalent sleep-related breathing disorder among different populations.
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0479

THE ASSOCIATION OF POSITIONAL OBSTRUCTIVE SLEEP APNEA WITH BLOOD PRESSURE

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Introduction: Obstructive sleep apnea (OSA) is associated with hypertension and adverse cardiovascular (CV) outcomes. Sleep position plays a critical role in the pathophysiology of OSA. Generally, positional OSA (POSA) refers to OSA that mostly occurs in the supine position, the most vulnerable position for upper airway obstruction. It is unclear whether POSA has CV risk implications. The purpose of this study was to compare blood pressure (BP) and BP variability (BPV), two well-established CV risks between the patients with POSA and non-POSA.
Methods: We included patients who had at least three separate BP measurements taken during office visits within one year prior to clinically indicated polysomnography at a single center. Systolic BP (SBP), diastolic BP (DBP), SBP coefficient of variation (SBP-CV) and DBP coefficient of variation (DBP-CV) were measured. POSA was defined by patients with an apnea-hypopnea index (AHI) ≥5 events/hour as well as supine AHI at least twice as high as non-supine AHI. ePOSA consisted of the previously mentioned criteria with the additional requirement that non-supine AHI normalize to < 5 events/hour. Independent two sample t-tests were performed for comparison.
Results: We included 1,750 patients with OSA (age 54 years and 59.5% female). Patients with POSA or ePOSA had a lower BMI than those with non-POSA or non-ePOSA. Those with POSA or ePOSA were more likely to have mild OSA (AHI 5-15 events/hour) compared to patients with non-POSA or non-ePOSA (52.7% vs. 48.2%; 71.8% vs 44%). Patients with POSA or ePOSA had a significantly lower SBP-CV compared to non-POSA and non-ePOSA (9.7 [4] vs 10.2 [4.2], p=0.014; 9.5 [SD 4.2] vs. 10.1 [SD 4.1], p=0.005). There were no significant differences in mean SBP, mean DBP, or mean DBP-CV in the comparison of POSA vs non-POSA. However, patients with ePOSA had a lower mean SBP (128.8 vs 131.2 mmHg, p=0.003) and mean DBP (73.6 vs 75 mmHg, p=0.004) than those with non-ePOSA.
Conclusion: POSA is associated with lower BP risk profile. This may have implications for this subgroup of OSA patients and their risk for hypertension and cardiovascular outcomes. Future studies should consider the positional component in studying CV risks of OSA.
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0480

LESS IS MORE? A STUDY COMPARING OUTCOMES BETWEEN 4% VS 3% HYPOPNEA SCORING RULES

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Introduction: The definition of respiratory events has evolved over decades. The current American Academy of Sleep Medicine scoring manual recommends hypopneas be defined by a ≥ 30% airflow reduction with either ≥ 3% desaturation or an arousal, while the prior "recommended" criteria of a ≥ 30% airflow reduction and associated ≥ 4% oxygen desaturation (with no requirement of arousal) was changed to "optional". Consequently, events previously characterized as a respiratory effort related arousal (RERA) may now be defined as a 3% hypopnea. We hypothesized that while the 3% apnea-hypopnea index (3%AHI) will be higher than the 4%AHI, the 3%AHI will be similar to the 4% respiratory disturbance index (4%RDI), and that the measurement of RERAs under 3% scoring criteria will be clinically insignificant.
Methods: We prospectively collected 70 consecutive in-lab polysomnography results in 4 adult age groups. We re-scored the respiratory events utilizing the 3% hypopnea rule, and compared the differences between 3% and 4% scoring criteria.
Results: Among the 70 studies (mean age 50, males 46%), the 3%AHI was significantly higher than the 4%AHI (+9.247 ± 1.161, p< 0.001). This was mainly due to increased hypopnea events (+10.313 ± 1.617, p< 0.001). The 3%AHI was significantly

different from the 4%RDI (+7.096 ± 1.133, p< 0.001). There were no significant differences between the 3% and 4% RERA indices, with both values being minimal. Results were similar in both diagnostic and titration phases of testing.
Conclusion: As previously shown, utilizing the 3% hypopnea rule results in an increased AHI. Most of this difference is related to hypopneas with negligible influence of RERAs. This may lead to increased diagnosis and severity of sleep-disordered breathing in the adult population, and potentially be associated with payer ramifications. Our findings demonstrated negligible RERA indices on average with either rule, thus calling into question the clinical significance of this index in most patients.
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0481
A NOVEL PHENOTYPE CLASSIFICATION FOR OBSTRUCTIVE SLEEP APNEA BASED ON HYPOXIC BURDEN

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Introduction: Currently, we rely on the apnea-hypopnea index (AHI) to diagnose and quantify the severity of obstructive sleep apnea (OSA). However, AHI does not reflect the severity of respiratory events and does not capture the heterogeneity of patients with OSA. This study aimed to establish a novel phenotype classification based on a refined hypoxic burden (HB) and investigated its associations with a wide range of OSA-related health outcomes.
Methods: We retrospectively recruited 250 participants in each of four groups: normal (AHI < 5), mild (5 ≤ AHI < 15), moderate (15 ≤ AHI < 30), and severe (AHI ≥ 30) OSA. To calculate HB, we adopted the method developed by Ali et al.,1 and we further divided HB into apnea-specific HB and hypopnea-specific HB, defined as HB calculated only based on apnea and hypopnea events, respectively. Hierarchical cluster analysis was performed based on the log scale of apnea-specific HB and hypopnea-specific HB to explore OSA phenotypes. We compared demographics and clinical outcome variables, including the prevalence of cardiometabolic disorders, comorbidity scores, and brain age index (BAI) based on sleep-EEG among these subtypes.
Results: After excluding participants with poor data quality, 954 participants were analyzed. These participants were classified into five clusters (Figure): subgroup #1 (n=177, 'normal sleepers'), subgroup #2 (n=211, 'mild hypopnea-driven HB'), subgroup #3 (n=225, 'moderate HB'), subgroup #4 (n=225, 'severe HB'), and subgroup #5 (n=116, 'extreme HB with apnea-dominance'). Compared to subgroup #1, all other groups (subgroup #2-5) had a higher risk of hypertension and total comorbidity scores. By contrast, BAI was increased only in subgroups #4 and #5, with a significant correlation between apnea-specific HB and BAI. Different health outcomes were observed among subgroups even within the same AHI severity category.
Conclusion: This novel phenotype classification of OSA revealed significant associations with clinical outcomes, surpassing the limitations of the traditional categorization based on AHI. These insights could be used for risk stratification and the design of future OSA-related studies.
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0482
PREVALENCE AND DEMOGRAPHIC CHARACTERISTICS OF TRIPLE OVERLAP SYNDROME AMONG ADULTS IN THE UNITED STATES

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Introduction: Chronic obstructive pulmonary disease (COPD) and obstructive sleep apnea (OSA) often coexist, forming the "overlap syndrome", which is associated with a worse prognosis than either disease alone. With the anticipated rise in the prevalence of severe obesity (body mass index ≥ 40), it can be projected that more patients will present with "triple overlap syndrome" (i.e., presence of severe obesity, COPD, and OSA), a distinct phenotype requiring complex disease management. This study determined the prevalence of triple overlap syndrome among U.S. adults and evaluated its prevalence over time and across demographic characteristics.
Methods: Cross-sectional analysis of 2005-2006, 2007-2008, 2015-2016, and 2017-2018 National Health Nutrition Examination Survey (NHANES) waves using self-report data. High risk of OSA was determined with an adapted multivariable apnea prediction (MAP) index score of > 0.5. Survey-based Rao-Scott corrected $\chi 2$ test or t-test was used to compare prevalence rates between NHANES waves and to examine differences in age, sex, race/ethnicity, education, and health insurance status between those with triple overlap syndrome and overlap syndrome.
Results: A total of 8373 participants (mean age 57.2 ± 0.3; 69.8% women; 70.9% non-Hispanic White) were included in the overall sample. The prevalence of triple overlap syndrome was 1.9% and increased from 1.1% in 2005-2008 to 2.7% in 2015-2018 (a nearly250% increase, p< 0.001), driven by increased rates of OSA, COPD, and severe obesity of 6.5%, 1.8%, and 2.3%, respectively. Overlap syndrome prevalence increased from 5.6% to 7.5%. Those with triple overlap syndrome were predominately middle-aged women of racial/ethnic minority, with at least a high school education and health insurance. As compared to those with overlap syndrome, those with triple overlap syndrome were younger (56.7 vs. 64.2 years, p< 0.001), more likely to be women (62.4% vs. 29.2%, p< 0.001), and less likely to be non-Hispanic White (43.4% vs. 61.9%, p< 0.001). Education and health insurance status were similar between groups.
Conclusion: Women and ethnic/racial minorities may represent high-risk groups that should be targeted for assessment of the growing triple overlap phenotype. Further research is needed to explore social and environmental determinants of health disparities in the prevalence of triple overlap syndrome.
Support (if any): No support

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0483

REAL-WORLD STUDY OF HEART RATE VARIABILITY DURING SLEEP USING UNDER-MATTRESS SENSORS IN OVER 30,000 INDIVIDUALS

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Introduction: Heart rate variability (HRV), the beat-to-beat variation of the heartbeat signal, is a quantitative marker of Autonomic Nervous System (ANS) balance that may be influenced by obstructive sleep apnea (OSA) if measured during sleep. Notably, little is known about overnight HRV, and how this metric may differ by age, gender, or severity of OSA.

Methods: We used a commercially available home monitoring device (Sleeptracker-AI Monitor, Fullpower Technologies Inc., California, USA) that measures HRV non-invasively and continuously during sleep using under-mattress piezo-electric sensors. We focus on two key HRV time domain metrics, the root mean square of successive RR interval differences (RMSSD, a measure used to estimate parasympathetic activity) and standard deviation of RR intervals between normal heartbeats (SDNN, a measure of overall variability influenced by both sympathetic and parasympathetic activity).

Results: We included data from 38,475 subjects [20712 males, 46.9±12.7 years; 17763 females, 46.7±12.6 years; 1575 with moderate to severe OSA (AHI≥15) and 30,816 without OSA (AHI< 5)] with 2,720,720 recorded nights, collected from 08/16/2023 to 12/15/2023. Both HRV metrics decreased with age, whereas SDNN was lower in females. For both females and males, individuals with moderate to severe OSA had significantly lower RMSSD than those without OSA, though these differences decreased with age and were only significant among those aged 20-39 years [mean difference (MD)=-5.21, standard error (SE)=1.66 for females; -6.57, 0.97 for males] or 40-59 years [MD=-2.33, SE=0.60 for females; -2.43, 0.33 for males]. Meanwhile, individuals with moderate to severe OSA had significantly higher SDNN than those with no OSA, and these differences increased with age and were only significant among those aged 40-59 years [MD=2.39, SE=0.82 for females; 2.33, 0.42 for males] or 60-79 years [MD=2.14, SE=0.89 for females; 1.91, 0.56 for males]. For all age groups, men with moderate to severe OSA had significantly higher heart rate (HR) compared to those without OSA.

Conclusion: HRV during sleep varies with age, gender, and severity of OSA. OSA severity had different associations with HRV metrics relevant to sympathetic vs. parasympathetic activity. Emerging sleep technologies provide new opportunities for clarifying the association between HRV during sleep and OSA.

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0484

HEART RATE VARIABILITY AND DEEP LEARNING ANALYSIS OF OBSTRUCTIVE SLEEP APNEA USING ECG FROM POLYSOMNOGRAPHY

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Introduction: Previous studies suggested that obstructive sleep apnea (OSA) can affect the autonomic nervous system. Patients with OSA appear to have a higher sympathetic component, a lower parasympathetic component, and greater autonomic nervous system (ANS) imbalance. We compared heart rate variability (HRV) with existing studies and confirmed classification accuracy through deep learning analysis (DLA), using electrocardiogram (ECG) data extracted from polysomnography (PSG).

Methods: We retrospectively surveyed people who underwent PSG at our hospital from January 2015 to March 2023. The diagnosis of OSA was classified into normal, mild, moderate, and severe based on AHI, and whether arrhythmia was identified during the test was also investigated. HRV analysis performed by frequency domain analysis of the tachogram. For DLA, the tachogram was converted to a Mel-spectrogram and a Convolutional Neuronal Network (CNN) was used to confirm the confusion matrix.

Results: Of a total of 1,806 PSG, 1,554 cases were selected, excluding 252 cases of arrhythmia. OSA confirmed by PSG was normal in 282 patients, mild in 334, moderate in 293, and severe in 645. When comparing the results of HRV divided into AHI below 15 and above, VLF power (ms2/Hz) was 940.78 ± 763.72 vs 1132.75 ± 1104.50 ($p < 0.001$), LF power (ms2/Hz) was 719.26 ± 734.71 vs. 724.46 ± 945.26 ($p = 0.908$), HF power (ms2/Hz) was 763.61 ± 1058.92 vs 595.53 ± 1386.75 ($p = 0.011$), and LF/HF ratio was 1.27 ± 0.74 vs 1.63 ± 1.02 ($p < 0.001$). As a result of DLA, the ROC AUC Score was confirmed to be 0.7077 and the F1 Score was 0.67.

Conclusion: As a result of HRV using ECG from PSG, OSA patients were found to have low HF power and high LF/HF ratio, similar to previous studies. Additionally, if tachogram's

DLA accuracy can be improved through preprocessing and deep learning model improvements, it is expected that it can be used as a screening tool in various place.
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0485

CAN HYPOXIC BURDEN PREDICT IMPROVEMENT IN SLEEPINESS AND COGNITION IN RESPONSE TO CPAP TREATMENT IN OSA PATIENTS?

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Introduction: Obstructive sleep apnea (OSA) affects more than 10% of older Americans and is associated with future comorbid conditions. The current method for measuring OSA severity, the apnea-hypopnea index (AHI), is poorly correlated to symptom burden and clinical improvement. Hypoxic burden (HB), which quantifies and characterizes OSA-related hypoxemia, has been suggested as an alternative OSA measure. However, more research is needed to understand HB's predictive ability. Thus, this study investigated whether HB could predict which OSA patients, prescribed CPAP, will have the greatest improvement in measures of sleepiness and cognition.
Methods: This is a secondary analysis from a trial that investigated the effects of CPAP versus sham treatment on sleepiness [Epworth Sleepiness Scale (ESS), psychomotor vigilance test (PVT)] and cognition [Buschke Selective Reminding Test (BSRT), Sustained Working Memory Test (SWMT), Cogscreen Pathfinder Number (PN)]. Using the SpO2 signal, HB was calculated as the area under the desaturation curve during all desaturation events (sustained >3% dip in SpO2). For categorical analyses, we classified "sleepy" and "not sleepy" in two different ways: ESS≥10 or < 10 and PVT lapses≥4 and < 4, respectively.
Results: Of the 426 (66% male) participants included, ESS and PVT significantly decreased after two months of treatment; 10.2±4.2 vs 8.0±4.2 ($p< 0.001$) and 2.5±1.6 vs 2.3±1.4 ($p< 0.01$), respectively. After correcting for BMI, age, sex, and AHI, baseline HB was associated with a change in sleepiness after treatment (ΔESS $R2=0.04$, $p< 0.001$; ΔPVT $R2=0.01$, $p< 0.05$). Moreover, having higher baseline HB increased odds for transitioning from "sleepy" to "non-sleepy" based on ESS (1.006 [1.001, 1.012]) or PVT (1.07 [1.003, 1.011]). HB was not associated with change in cognitive variables at follow-up ($p>0.05$), before correcting for any covariates.
Conclusion: HB had a significant yet weak effect on subjective (ESS) and objective (PVT) measures of sleepiness after correcting for covariates. HB did not significantly explain changes in any cognitive measure after two months of CPAP treatment. Whether this lack of an association is due to the absence of an overall improvement in cognition or the inability of HB to explain variability remains to be tested.
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0486

PERFORMING POLYSOMNOGRAPHY IN THE ACUTE POST-STROKE SETTING

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Introduction: Despite being the leading cause of disability in adults, there are still limited treatments for ischemic stroke due to its narrow therapeutic window. Thereby, it is imperative to develop new strategies to prevent recurrent strokes and improve stroke recovery. Obstructive sleep apnea (OSA), the most common form of sleep-disordered breathing, is disproportionately prevalent among the stroke population, with prevalence estimates around 70%. Furthermore, many studies have established OSA as an independent risk factor for future stroke. We examined the potential benefit of bringing OSA diagnosis and therapy to the inpatient hospital setting by offering polysomnography (PSG) to stroke patients in the acute post-stroke environment.
Methods: Patients were recruited from the Yale New Haven Hospital, a large academic urban hospital, specifically within the following departments: Emergency Departments, Stroke units, and Neurology services. The electronic medical record was used to screen patients for various inclusion and exclusion criteria. Over the three years of active recruitment, 3,507 patients were screened. To assess the potential efficacy of this study design, the percentage of patients who were deemed eligible, who were enrolled, who received PSG, and who demonstrated a positive OSA diagnosis, were analyzed. For this study, OSA was defined as at least 15 apneas or hypopneas per hour.
Results: Of the 3,507 patients that were screened, 1,109 (31.6%) were deemed eligible for the study and 705 (63.6%) were approached for recruitment. Among those approached, 171 consented to participate and 107 underwent PSG testing with 97 (90.7%) demonstrating moderate or severe OSA.
Conclusion: The proportion of patients with sleep apnea in this study is higher than previously seen. One of the strengths of this study is the high ascertainment of PSG in the post-stroke acute setting. Additionally, the AHI cutoff of 15 events per hour likely led to an underestimation of OSA prevalence, further strengthening our findings. Limitations of this study include (1) selection bias, as patients with existing symptoms of OSA were more likely to enroll, and (2) the intentional timing of the PSG in the acute setting. This study demonstrates high rates of OSA in the acute post-stroke setting, paving the way for future interventions.
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0487

POLYSOMNOGRAPHY ASSOCIATIONS WITH ALL-CAUSE HOSPITALIZATION FOLLOWING TBI NEUROREHABILITATION DISCHARGE

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Introduction: Obstructive Sleep Apnea (OSA) is prevalent in neurorehabilitation admissions in patients with traumatic brain injury (TBI). OSA is independently associated with hospital readmission within 30 days of discharge in the general population. Prior studies showed rates of rehospitalizations in TBI patients are estimated at 28%. The most common rehospitalization causes are infection, neurologic issues, neurosurgical procedures, injury, psychiatric, and orthopedic. While older age, history of seizure, and greater physical and mental health comorbidities have been associated with rehospitalization following TBI, early objective measures of OSA have not been examined.
Methods: This is a retrospective analysis of TBI Model Systems (TBIMS) participants enrolled in a multicenter comparative effectiveness trial followed over the first two years post-discharge (n=175). Participants received level I polysomnography (PSG) during inpatient neurorehabilitation. Differences in PSG indices were examined by rehospitalization rates to determine associations. Mean age of 43.4 (SD 17.6), mostly of white ethnicity (74%). Multiple regression was used to examine rates of hospitalizations across PSG indices controlling for age.
Results: 102 patients (58%) had no hospitalization in the first 2 years of follow-up while 73 (42%) had at least 1 hospitalization (28 had 1 hospitalization, 45 had >1 hospitalization). While the apnea hypopnea index between the re-hospitalized (15.7) vs non-re-hospitalized (14.8) was not significantly different, the mean O2 nadir was 84.8% and 86.9%, respectively (r2=-2.49, $p < 0.02$, CI: -4.53, -0.45).
Conclusion: This is the first study looking at rehospitalization in patients with TBI and OSA, showing that re-hospitalized patients were more likely to have a worse O2 nadir warranting further exploration of PSG indices and the role of sleep apnea in rehospitalization following neurorehabilitation discharge after TBI.
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0488

EXPLORING STUDY RECRUITMENT TRENDS IN THE ACUTE POST-STROKE SETTING

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Introduction: Obstructive sleep apnea (OSA) is a form of sleep-disordered breathing due to intermittent upper airway closure causing hypoxia, sympathetic activation, and hemodynamic changes that impact cerebral blood flow during sleep and predispose to ischemia. OSA is a well-established independent risk factor for acute ischemic stroke (AIS) with a prevalence estimate ranging from 60-80%. The Recovery in Stroke Using Positive Airway Pressure (RISE-UP) clinical trial is an ongoing study designed to investigate the influence of OSA treatment with continuous positive airway pressure (CPAP) on post-stroke functional recovery in both the subacute and acute post-AIS setting.
Methods: The RISE-UP trial recruits patients admitted to Yale-New Haven Hospital, a large academic medical center in an urban location. Over a period of three years, 3507 patients have been screened for the study. Preliminary data was analyzed for trends in recruitment. Exclusion criteria included being unable to consent for themselves, past use of CPAP, and an estimated life expectancy of less than six months. Passive refusal can be defined as when patients choose not to enroll or participate without actively expressing a refusal.
Results: Of the 1109 (31.6%) patients deemed eligible for the study, 705 (63.6%) were approached, 171 (24.2%) consented to participate, and 489 (69.3%) refused. Among those who refused, the most common reasons were lack of interest (58.8%), passive refusal (21.7%), feeling overwhelmed (12.3%), and family discouragement (4.1%).
Conclusion: The recruitment data presented provides useful insight into the potential challenges of recruitment in the immediate post-stroke setting. In particular, the most common reasons for refusal included lack of interest, passive refusal, and feeling overwhelmed. Based on these findings, more robust education regarding the pertinence of OSA screening in those at risk for cardiovascular disease, such as stroke, and the relationship between OSA and AIS may increase enrollment among this patient population in the future. By understanding patient's concerns and collaborating with the healthcare system, this analysis serves as a valuable opportunity to aid in recruitment efforts within this domain.
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0489

AGE MODIFIES THE ASSOCIATION BETWEEN SEVERE SLEEP APNEA AND MORTALITY

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Introduction: Prevalence of sleep apnea (SA) increases with age. However, data on severity of SA and aging and its impact on health outcomes is not known. We assessed the interaction between severity of SA and all-cause mortality in different age categories using large, longitudinal data.
Methods: We used Natural Language Processing program to extract apnea hypopnea index (AHI) from text of physician interpretation of sleep studies, i.e., polysomnograms and home sleep apnea testing, performed at the veteran health administration (VA) from 2000-2022. We grouped the participants to no-SA (n-SA, AHI< 5) and severe SA (s-SA, AHI>30) and excluded AHI range of 5-29. We further stratified the cohort based on age: Young, < 40; Middle, >40 and < 65; and older, >65. We calculated odds ratio (aOR) for mortality adjusted for age, sex, race, ethnicity, and Charlson-Comorbidity Index using n-SA as reference.
Results: We identified 209,374 participants (age, 54.7 ±14.4; BMI 32±5.25; male 90%, White 67%). Prevalence of s-SA increased with age categories as well as CCI. However, increases in BMI between n-SA and s-SA differed with the age categories (30.0 vs 34.1; 30.8 vs. 34.3; and 29.8 vs 32.2, for young, middle-age

and elderly, respectively). All-cause mortality rates were higher in s-SA, compared to n-SA independent of age (young, 1.7% vs 1.2%; middle age, 10.41% vs 10.62%; and older adults, 23.04% vs 30.10%). However, the aOR of mortality among s-SA compared to no-SA reversed as the age categories increased (young, 1.14,95%CI:1.04,1.23; middle age, 0.90,95%CI:0.88,0.92; and older adults, 0.83,95%CI:0.59,0.84).
Conclusion: Although the prevalence of severe SA increases by age, the odds of all-cause mortality compared to no-SA diminished. The data suggests that older adults may be protected against harmful OSA outcomes. A causality analysis is warranted to assess the relationship between sleep apnea, aging, and mortality.
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0490

SLEEP APNEA SEVERITY HAS A U-SHAPED ASSOCIATION WITH ALL-CAUSE MORTALITY

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Introduction: Sleep apnea (SA) severity is determined by apnea hypopnea index (AHI). The interaction between SA and mortality is debated. We explored the relationship between severity of SA and mortality. We further investigated the effect of age on this relationship.
Methods: We developed an Natural Language Processing program (evaluated with 972 notes manually annotated notes) to extract apnea hypopnea index (AHI) from text of physician interpretation of sleep studies, i.e., polysomnograms and home sleep apnea testing, performed at the veteran health administration (VA) from 2000-2022. We grouped the participants to no-SA (n-SA, AHI< 5), mild to moderate SA (m-SA, 5 < AHI < 30) and severe SA (s-SA, AHI>30). We further stratified the cohort based on age: Young, < 40; Middle, >40 and < 65; and older, >65 adults. Using logistic regression, we estimated odds ratio (aOR) for mortality adjusted for age, sex, race, ethnicity, and Charlson-Comorbidity Index using m-SA as reference.
Results: 427,587 patients (age, 55.1±14.6 years; BMI, 32.7±6.2; male, 90.5% and 65% male) had at least one documented AHI. The NLP algorithm achieved to high recall (89%), specificity (91%) and F1-score (88%). Mortality rates were 10.8%, 7.7%, and 13.4% in the n-SA, m-SA, and s-SA, respectively. aOR for all-cause mortality rates in Young for n-SA was 1.08 (0.94-1.20) vs s-SA 1.20 (1.08-1.26); in Middle Age for n-SA was 1.40 (1.33-1.41) vs s-SA 1.20 (1.15-1.24); and in Older was for n-SA 1.49 (1.45-1.52), s-SA 1.04 (1.00-1.08).
Conclusion: All-cause mortality rate relates to the severity of SA in a U-Shaped appearance. The U-shape appearance increases markedly with age. Further investigations into mechanisms of the U-Shaped appearance is needed.
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0491

EXPLORING COMISA, SLEEP-RELATED SYMPTOMS, AND HEALTHCARE UTILIZATION IN MILITARY PERSONNEL

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Introduction: Insomnia and obstructive sleep apnea (OSA) are the two most common sleep disorders seen in clinical practice. Comorbid insomnia and OSA (COMISA) is a very common clinical presentation. The purpose of this study was to estimate the effect of COMISA on sleep, daytime symptoms, and healthcare resource utilization compared to OSA or insomnia alone among military personnel.
Methods: Military personnel with sleep problems were recruited from two military treatment facilities. Insomnia and OSA were defined using validated cutoffs on the Insomnia Severity Index and Berlin Questionnaire, respectively, and COMISA was defined as comorbid insomnia and OSA. Subjective and objective sleep were measured via standardized sleep diaries and a commercial wearable (Fitbit Inspire 2) over ten days. Daytime symptoms (e.g., sleepiness, depression, anxiety, pain) were assessed using standardized self-report questionnaires. Subjective cognition was assessed via three Likert items. Healthcare resource utilization (HCRU) was assessed using an established questionnaire tailored for this study. To compare differences between COMISA, OSA, and insomnia groups, one-way ANOVA was performed.
Results: The final sample included 201 participants (n=113, 43.8[%] men, mean age=44.5 [SD=12.7]) who self-reported being of White (111, 55.2%), Black (50, 24.9%), Hispanic (21, 10.5%) or Other (19, 9.5%) race. Of these, 22 (10.9%) were categorized as insomnia alone, 98 (48.8%) as OSA alone, and 81(40.3%) as COMISA. Relative to individuals with OSA, individuals with COMISA demonstrated worse subjective (but not objective) sleep; worse subjective daytime symptoms; worse subjective memory, attention, and executive function; and increased healthcare utilization including total HCRU and outpatient visits to internal medicine, neurology, emergency department, and urgent care. Some but few significant differences were observed between participants with insomnia relative to those with COMISA.
Conclusion: Among military personnel with sleep problems and relative to OSA alone, COMISA was associated with worse subjective sleep, worse daytime symptoms, worse subjective cognition, and greater HCRU. Future research should seek to seek to improve health and economic outcomes among individuals with COMISA.
Support (if any): DoD (W81XWH1990006 via the Medical Technology Enterprise Consortium)

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0492

US VETERANS WITH COMISA, SLEEP APNEA, AND INSOMNIA: CHRONOTYPE PREVALENCE AND PATIENT-REPORTED OUTCOMES

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Introduction: Among US veterans, it is unclear whether insomnia, obstructive sleep apnea (OSA), and comorbid insomnia in sleep apnea (COMISA) carry disproportionate burden to patient-reported functional outcomes (PROs). Furthermore, whether chronotypes vary among these sleep disorders groups and contribute independently to PROs has not been explored.
Methods: Veterans at risk for OSA evaluated at the Miami VA Sleep Center evaluated over one year. Veterans completed home polysomnography (PSG) and questionnaires (demographics, insomnia severity index [ISI], patient-reported outcomes [PROMIS-29]). OSA diagnosis was per AHI ≥ 5 on PSG while insomnia was per ISI ≥ 15. Those with COMISA fulfilled both of these criteria. Chronotype was self-reported as "morning [M]", "more morning than evening [M>E]", "more evening than morning [E>M]" or "evening [E]" type. Sleep group characteristics were compared by ANOVA or Chi-square. Then, regression models were constructed to determine the association of COMISA and insomnia disorder reference to OSA alone on PROMIS domain T-scores. Finally, to explore whether chronotype was associated with PROs within each sleep group, regression models stratified by sleep disorder group were constructed.
Results: The cohort consisted of 387 veterans (85% male, mean age 52 ± 15 years) where 60 participants (16%) had OSA alone, 68 (18%) had insomnia alone, and 259 (67%) met COMISA criteria. Participants in the insomnia group were significantly more likely to be female, have lower mean BMI and were younger than the OSA alone and COMISA groups. The chronotype prevalence of morning, M>E, E>M, and evening were 33%, 24%, 26%, 16%, respectively. These did not vary across sleep disorder groups (p=0.15). In regression analyses, participants with insomnia alone and COMISA had worse anxiety, depression, fatigue, sleep disturbance, social disruption, physical function, and pain interference than veterans with OSA alone. However, in analyses stratified by sleep disorder groups, chronotype was not associated with any of these PROs
Conclusion: Veterans with COMISA and insomnia alone were more functionally impaired than those with OSA alone. However, chronotype prevalence was similar across veterans with OSA, insomnia, and COMISA and chronotype itself was not associated with PROs. Larger studies with objective measures of chronotype are needed to replicate these findings.
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0493

CHARACTERISTICS OF MIDDLE-AGED AND OLDER ADULTS WITH COMORBID INSOMNIA AND SLEEP APNEA VS. SLEEP APNEA ALONE

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Introduction: Sleep apnea and insomnia often co-occur in older adults, complicating treatment and worsening outcomes. More research is needed to characterize sleep apnea patients with and without co-morbid insomnia. We characterized differences in demographic and clinical characteristics between individuals with co-morbid insomnia and sleep apnea (COMISA) and those with sleep apnea alone in a national sample of U.S. middle-aged and older adults.
Methods: Data came from the 2018 interview of the Health and Retirement Study, a nationally representative cohort of approximately 20,000 U.S. older adults. Participants were asked if "a doctor had ever told them they have a sleep disorder," and if so, which disorder, including sleep apnea. Participants reported frequency of insomnia symptoms (difficulty falling asleep, waking during the night, waking too early, and feeling rested in the morning), and were categorized as having each symptom if they reported experiencing the symptom "most of the time" for the first three symptoms and "rarely or never" for the latter. Employing bi-variate logistic regression, we compared demographic and clinical characteristics of participants with sleep apnea who reported ≥1 insomnia symptom (COMISA) to those reporting 0 symptoms (sleep apnea alone).
Results: Among N=1,816 respondents reporting sleep apnea, 47.2% also had insomnia symptoms (COMISA). Compared to those with sleep apnea alone, participants with COMISA were younger (65.3±9.61 years vs. 66.4±9.25, p=0.015), and more likely to be female (51.5% vs. 40.3%, p< 0.001), but did not differ by race and ethnicity. They also were more likely to report several health conditions, including a markedly higher prevalence of mental health problems (43.1% vs. 24.8%, p< 0.001), dementia/cognitive impairment (4.9% vs. 2.7%, p< 0.001), and also have greater depressive symptomatology as measured by CES-D (2.8±2.44 vs. 1.1±1.67, p< 0.001).
Conclusion: Notable differences were identified between participants with COMISA and those with OSA alone. Of note, COMISA patients were more likely to have several health conditions, especially mental health, which suggests COMISA patients may benefit from psychosocial interventions aimed at improving treatment adherence and preventing poor health outcomes.
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0494

SLEEP RELATED RESPIRATORY EVENTS ON BUPRENORPHINE COMPARED TO NALTREXONE

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Introduction: Opioid medications are associated with an increased risk of sleep related respiratory events, especially central apneas. However, the potential impact of partial

agonists (buprenorphine) and full antagonists (naltrexone) is less well known. In this study we hypothesize that patients using buprenorphine will have a greater prevalence of central apneas and require more frequent use of bilevel PAP therapy than those using naltrexone.
Methods: We performed a retrospective chart review of patients in a sleep laboratory database identifying patients who were prescribed naltrexone or buprenorphine at the time of a diagnostic PSG or PAP titration between 2019 and 2023. We only included initial diagnostic studies and initial titrations. The patients were split into four groups (buprenorphine/diagnostic, buprenorphine/titration, naltrexone/diagnostic, naltrexone/titration). Polysomnograms (PSG) were performed and scored in accordance with AASM guidelines. The Epworth Sleepiness Scale (ESS) and standard PSG variables were collected, and group differences were analyzed. Statistical significance was determined using a two-tailed T test.
Results: A total of 87 patients and 114 studies were included (n= 43 buprenorphine/diagnostic, n=25 buprenorphine/titrations, n=22 naltrexone/diagnostic, n=24 naltrexone/titration). Overall average age was 48 years, with 60.5% female. No significant difference of age or gender was found between the groups. All groups had high rates of underlying hypertension, depression, anxiety, and substance use disorders. Patients on buprenorphine were subjectively sleepier and demonstrated more frequent sleep-related respiratory events. Patients on buprenorphine presenting for initial diagnostics had higher ESS scores (11.1 vs. 7.14, p=0.017), and higher sleep efficiency (87.3% vs. 78.6%, p=0.045). The buprenorphine group had higher mean AHI (18.0 vs. 8.62, p=0.008) and more central apneas per hour, but this did not meet statistical significance (5.21 vs. 1.81, p=0.12). In the PAP titrations, patients on buprenorphine had more difficult titrations and a greater proportion of the buprenorphine group failed CPAP and required bilevel PAP.
Conclusion: Our cohort demonstrates a higher degree of subjective sleepiness, a tendency toward more central apneas, and increased likelihood to fail CPAP and require bilevel PAP in patients prescribed buprenorphine. We believe clinicians should have a higher degree of suspicion for central apnea in patients who are prescribed partial opioid agonists.
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0495

ASSOCIATION OF CANNABIS USE AND SYMPTOMS AMONG PATIENTS WITH OBSTRUCTIVE SLEEP APNEA

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Introduction: The use of recreational substances such cannabis is linked to sleep quality. Long-term cannabis use has been linked to increased sleep latency, less slow wave sleep, and worse sleep efficiency. However, little is known about the relationship between cannabis use and subjective OSA symptoms. We examined the association of cannabis use and symptoms among patients newly diagnosed with and yet to be treated for OSA.
Methods: This was an interim analysis of participants enrolled in the NICEPAP Study (n=182/267, NCT05067088) a prospective observational study assessing physiological predictors of CPAP effectiveness. Participants self-reported cannabis use over a six-month period prior to OSA diagnosis. Outcomes included symptoms of pain affecting sleep, parasomnias, nightmares, sleep latency, sleep duration, insomnia symptoms (Insomnia Severity Index), sleepiness (Epworth Sleepiness Scale), sleep quality PROMIS (Patient-Reported Outcomes Measurement Information System) and OSA-related quality of life FOSQ (Functional Outcomes of Sleep Questionnaire). Groups were compared using Chi-squared, and the Mann-Whitney U tests as appropriate.
Results: We studied 182 enrolled participants, 47% were male with a mean age of 51.3 years; of this total sample, 32 patients (17%) reported cannabis use. Users of cannabis reported more regular alcohol use and tobacco use (72% vs 46% and 44% vs. 29% respectively, p< 0.01). No differences were observed in other demographics, sleep latency, self-report sleep duration or OSA severity. Cannabis users reported higher but not statistically significant proportion of pain during sleep (38% vs 25%, p=0.17). No differences from non-users were noted for other presenting symptoms including nightmares, parasomnias, insomnia, sleepiness, sleep quality or OSA-related quality of life.
Conclusion: One in six individuals in this cohort of individuals recently diagnosed with OSA, reported use of cannabis. Cannabis users also noted higher consumption of alcohol and tobacco. There was a trend for higher prevalence of pain affecting sleep. Notably, no other statistical differences were noted upon analysis of daytime and nighttime symptoms. Further research is needed to better understand the long-term effects of cannabis on subjective symptoms of sleep in OSA patients.
Support (if any): This study was supported by the Parker B. Francis Foundation, National Heart, Lung, and Blood Institute NIH/NHLBI

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0496

A NARRATIVE REVIEW OF THE RELATIONSHIP BETWEEN HEAD AND NECK CANCER AND OSA

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Introduction: Cancer patients with comorbidities have suboptimal treatment outcomes and lower survival rate. Obstructive sleep apnea (OSA) is an underdiagnosed and undertreated cancer comorbidity, especially within the head and neck cancer (HNC) population. There are complex, bidirectional associations between OSA and HNC. Refining HNC-OSA management necessitates an improved grasp of the HNC-OSA relationship. This study reviews the current course of HNC therapy, causal and associative relationships before and after treatment, and statistical methods quantifying HNC-OSA interactions.
Methods: A review of the literature was conducted using PubMed, Google Scholar, Web of Science, Microsoft academic, Semantic, Europe PMC, Scopus, and Crossref databases to collect articles related to OSA in patients with HNCs.
Results: The search yielded 3122 articles, which was narrowed to 26 articles using PRISMA guidelines. There was a total of 382 patients in this review. The investigation confirms a positive correlation between the apnea-hypopnea index and primary tumor size. The associate and causal relationship between OSA and HNC treatment was complex and requires further study.
Conclusion: The paper provides an overview of existing statistical models, offers suggestions for model selection, framework for designing experiments that delve into research questions

surrounding the link between OSA and HNC across various stages of cancer treatment. Despite progress, understanding of the HNC-OSA interplay remains incomplete due to limited histological, molecular, and clinical data. Future studies with longitudinal data are crucial for comprehensive insights.

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0497

OBSTRUCTIVE SLEEP APNEA PREVALENCE IN A YOUNG MIXED TRAUMA POPULATION WITH POST-TRAUMATIC STRESS DISORDER SYMPTOMS

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Introduction: Disturbed sleep appears to play a role in post-traumatic stress disorder (PTSD) development and maintenance. The prevalence of obstructive sleep apnea (OSA, as defined as an AHI>5 events/hr) has been reported to be up to 75% in individuals with PTSD (Zhang 2017). Most prior studies investigating OSA prevalence in PTSD have been conducted in military populations, who commonly have other risk factors for OSA such as being male, middle-aged and having high rates of substance use disorders. The aim of this study was to determine whether OSA is more common in individuals with PTSD symptoms exposed to non-military traumas as compared to individuals without PTSD symptoms.

Methods: 125 participants interested in completing a sleep study completed a screening questionnaire measuring previous Criterion A trauma exposure (Life events checklist) and PTSD symptoms (PTSD symptom checklist for DSM-5, PCL-5), along with alcohol use and demographic information. A sub-set were recruited for a standard overnight polysomnography either in the sleep laboratory (Grael, Compumedics), or at home (Siesta, Compumedics). Sleep studies were scored blinded to questionnaire data by an independent sleep technician. Three symptom severity groups were compared, individuals with Likely PTSD (PCL-5 >33 and Criterion A trauma exposure) Sub-Syndromal PTSD (PCL-5 15-33 and Criterion A trauma exposure) or No-PTSD (PCL-5 < 15 and no intrusive symptoms).

Results: 45 participants (31 female; aged 18-48 years) completed the polysomnography. 11 had likely PTSD, 10 Sub-Syndromal PTSD and 23 had No-PTSD. The 3 groups were comparable in age (25±7 years), sex (68% women) and BMI (24.2±4.5 kg/m2). In total, 6 participants had AHI >5 events/hr; 3 in the Likely PTSD group, 2 in the Sub-Syndromal group and 1 in the No-OSA group. The mean AHI did not differ between groups (Likely PTSD = 5.1±7.7, Sub-Syndromal PTSD = 4.0±6.7, No-PTSD = 2.2±4.4 events/hr, p=.64).

Conclusion: Although the a priori sample size (n=26 in each group) has not yet been reached, these preliminary data indicate that the prevalence of OSA in a young mixed-trauma PTSD population is unlikely to be as high as has been observed previously. PTSD may only increase the risk for OSA in older/heavier individuals.

Support (if any): University of Melbourne.

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0498

DRIVING PERFORMANCE OF OSA REFERRALS IS NOT CORRELATED WITH ODI OR ESS: PRELIMINARY RESULTS FROM THE ODESA STUDY

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Introduction: Untreated obstructive sleep apnoea (OSA) is associated with 3-fold increased risk of a motor vehicle collision. To date research in this area has focused on driving simulators, crash records and emergency room reports each of which has limitations. Predictors of poor on road driving performance with OSA are not well developed.

Methods: We are recruiting to a study (ODESA), to assess on-road driving performance, collected through a smartphone app developed by our industry partner (Sentiance). Participants are recruited from referrals for investigation of possible OSA. Here, we present preliminary data from the first participants to assess if our measures of driving distinguish varying levels of performance between drivers, and if any measure is correlated with levels of oxygen desaturation (ODI), and Epworth Sleepiness Scale (ESS). Driving scores of Hard Events, Hard Acceleration and Hard Turning were compared across participants using one-way ANOVA's, and tests of correlation with ODI and ESS were computed using Spearman's Rho.

Results: 10 participants (51 +/- 12 years [mean +/- SD], 4 female), have recorded 683 journeys (68 +/- 36 [mean +/- SD]). Significant effects of driving scores between participants, were found for Hard Events ($F[9,533]=16.3$, $p< 0.00001$), and Hard Acceleration ($F[9,592]=5.64$, $p< 0.00001$), but not Hard Turning ($F[9,590]=1.48$, $p= 0.15$). There was no reliable relationship between either ODI (10.2 +/- 15.6 [mean +/- SD]) and Hard Events (rs=.18, p=.63), Hard Acceleration (rs=.25, p=.49) and Hard Turning (rs=-.14, p=.7), or EES (10.9 +/- 4.8 [mean +/- SD]) and Hard Events (rs= .08, p=.83), Hard Acceleration (rs=.31, p=.39) and Hard Turning (rs= -.02, p=.96).

Conclusion: This preliminary analysis shows that despite finding variation in driving performance measures of Hard Events and Acceleration between participants, neither OSA severity or subjective sleepiness (EES), was correlated with the current data configuration. The ODESA study plans to test if neurophysiological measures (EEG), and temporal experience traces (TET), are more informative measures of driving behaviour in patients with suspected OSA.

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0499

RELATIONSHIP BETWEEN RDW AND DISEASE BURDEN IN OBSTRUCTIVE SLEEP APNEA

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Introduction: Obstructive sleep apnea (OSA) has significant physiologic consequences. The Apnea-Hypopnea Index (AHI) is used to define severity, but AHI only reflects the rate of

sleep-disordered breathing events and does not correlate well with clinical outcomes that arise from hypoxia. Percentage of cumulative time with oxygen saturation below 90% (T90) and hypoxic burden (HBI) more accurately reflect nocturnal hypoxia and may be more suitable correlates to morbidity associated with sleep apnea. Rising Red Cell Distribution Width (RDW) reflects dysregulation in erythrocyte homeostasis seen with metabolic derangements like oxidative stress and inflammation which has been shown to correlate with mortality in cardiovascular disease. Previous work demonstrates a linear relationship between RDW and AHI. We postulate there is a positive correlation between RDW, T90 and HBI.

Methods: A retrospective analysis of 1797 participants at Northwell with Home Sleep Apnea Testing or in-lab Polysomnography data and complete blood counts (CBC) within 6 months of the sleep study was performed. Subjects with chronic hypoxemia or hematologic conditions that may affect CBC were excluded. Ordinary least squares (OLS) regression was performed using RDW as the dependent variable and AHI, T90, HBI and mean saturation of peripheral oxygen (SpO2) as independent variables.

Results: OLS analysis revealed a statistically significant positive correlation between RDW and T90 (coef=.807 (CI 0.426,1.188), p-value=0.000034), HBI (coef=0.000033 (0.000019,0.000054), p-value=0.002)) and AHI (coef= 0.0062 (0.0028, 0.0097), p-value= 0.0004). A negative correlation was noted between mean SpO2 and RDW (coef=-0.047 (-0.078,-0.162), p-value=0.003).

Conclusion: There is a positive correlation with RDW and sleep apnea markers of disease burden, including T90, HBI, and mean SpO2. A 100% change in T90 (0 – 100%) in a patient will result in an increase in RDW by 0.8 and a 100% change in HBI (0 – 500 %min/hour) will result in an increase in RDW by 1.5. AHI was noted to poorly correlate with RDW. An AHI of 100 resulted in a 0.62 increase in RDW versus an AHI of 0. For the range of mean SpO2 observed (range 80 – 100%) the expected change in RDW is 0.94. This relationship requires further exploration in future studies.

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0500

SLEEP DISORDERED BREATHING IN CHILDREN WITH SANJAD-SAKATI SYNDROME

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Introduction: Sanjad-Sakati syndrome (SSS) is a rare, autosomal-recessive disorder with an estimated incidence of 1: 600,000 live births. 1 It has been primarily described in patients of Arab descent and manifests with extreme growth and developmental delays, hypoparathyroidism, scoliosis, risk for hypoglycemia, restrictive lung disease (RLD), and craniofacial abnormalities (infantile facies, depressed nasal bridge, micrognathia).1,2 RLD and low pulmonary reserve place affected children at high risk for sleep disordered breathing (SDB). To date, there are no reports of the pattern of SDB in these children.

Methods: We describe 2 female siblings with SSS who underwent polysomnogram (PSG) to evaluate for SDB.

Results: Patient one was 14 years old at time of PSG; she had severe short stature and RLD and presented with daytime fatigue and oxygen desaturation. She had baseline tachypnea and small oral and chest cavities. PSG demonstrated central sleep apnea (CSA) cAHI of 3.4/hr and REM dominant hypoventilation (CO2 52 - 67 torr), with 55% of total sleep time (TST) spent with CO2 > 50 torr. She was treated with BiPAP of 20/6 cw, with back up rate (BUR) 20/min to stabilize hypoventilation. Patient two had a similar clinical presentation; PSG at 19 years of age demonstrated severe REM-dominant CSA (cAHI 10.9/hr, REM cAHI 63.4/hr) with recurrent oxygen desaturations to a nadir of 67% and sleep hypoventilation (CO2 52-60 torr), 63% of TST was spent with CO2 > 50 torr. She was treated with BIPAP 19/5 with BUR 20/min.

Conclusion: Children with SSS are at high risk of SDB which is typically characterized by sleep hypoventilation that is worse in REM sleep, with severe REM hypoxemia and frequent CSA. They also tend to have poor sleep patterns, predominantly due to RLD and respiratory control dysfunction. Hence children with SSS should be screened for SDB and early treatment with bi-level positive pressure ventilation is recommended. In addition, these children are at high risk to study in sleep labs as they are at risk for seizures, rapid desaturations and/or hypoglycemia (due to low physiological reserve) and hence should be studied in the in-patient setting.

Support (if any): Included 2 references 1. doi:10.7759/cureus.8770 2. doi:10.3390/children9040448

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0501

SLEEP MEDICINE REFERRALS IN A HIGH-RISK OBSTETRICS POPULATION

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Introduction: Obstructive sleep apnea (OSA) has traditionally been underdiagnosed and undertreated in pregnancy. Untreated OSA has been associated with adverse peripartum outcomes, such as hypertensive disorders of pregnancy, diabetes, cesarean delivery and NICU admissions. In August 2023, a taskforce from the Society of Anesthesia and Sleep Medicine and the Society for Obstetric Anesthesia and Perinatology published recommendations that pregnant patients with obesity, gestational or pre-existing diabetes, or hypertensive disorders of pregnancy be screened for OSA. Currently, our Maternal-Fetal Medicine (MFM) group only screens for OSA in the obese pregnant population on a conditional basis. It is unknown how many of these patients are screened for OSA and/or referred to sleep medicine for follow-up.

Methods: This is a cross-sectional retrospective study to characterize the 19,439 pregnancies from January 1, 2012-December 31, 2022 at a rural health system with five labor and delivery units that would meet criteria for screening for OSA and a sleep medicine referral. Patients were included if they were over 18, pregnant and had at least a hypertensive disorder of pregnancy, diabetes (pre-existing or gestational) or were obese. The Cochrane-Armitage trend test was used to evaluate the rates over the time-period.

Results: In the initial data review, we found that between 2012 and 2022, the practice grew considerably; there was an increase in the proportion of women with gestational diabetes (16.9-31.2%, p< 0.01), obesity (75.0-75.2%, p< 0.01) and a hypertensive disorder

of pregnancy (22.9-25.8%, p< 0.01). Despite the increase in sleep medicine referrals during pregnancy (0.4-1.1%, p< 0.01) over the years, the overall referral rate to sleep medicine regardless of the selected peripartum co-morbidity remained low at 0.5-0.9%.
Conclusion: Less than 1% of patients at high-risk for OSA in pregnancy are being screened or tested for OSA. Based on the guidelines published in August 2023, these results establish a wide practice gap in our center. It is likely that this knowledge is generalizable to centers around the country. We conclude that there is a large opportunity to improve our maternal outcomes by connecting these at-risk patients with sleep medicine referrals to be screened and treated for OSA.
Support (if any):

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0502
IMPACT OF EXCESSIVE DAYTIME SLEEPINESS ON DAY-TO-DAY EXPERIENCE OF PATIENTS SUFFERING FROM OBSTRUCTIVE SLEEP APNEA

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Introduction: Today, excessive daytime sleepiness (EDS) is considered as one of the most frequently occurring clinical manifestations in patients with obstructive sleep apnea (OSA). According to the National Sleep Foundation 2000 Omnibus Sleep in America Poll: `a sizable proportion of adults (43%) report that they are so sleepy during the day that it interferes with their daily activities a few days per month or more; and, one out of five (20%) experience this level of daytime sleepiness at least a few days per week or more'.
Methods: Inclusion criteria The articles identified, were screened by title and abstract, and selected for full text review if they met the following inclusion criteria. 1)OSA and EDS should be primary or secondary outcomes and not incidental findings. 2) Studies showing clinical manifestations of EDS in patients with OSA such as problems with vigilance, cognitive function, memory, concentration, and mood; deterioration in school and/or job performance and productivity, social relationships, and driving skills Exclusion criteria Those articles and or studies were excluded from our analysis that included: 1)Patients who did not undergo the polysomnography.2)Patients who had pure or mainly central sleep apneas, co-morbidities, terminal illness 2) Patients with other causes of fatigue or excessive daytime sleepiness 3)Patients from pediatrics
Results: Our search strategy yielded 770 citations. Irrelevant papers were excluded by title and abstract review, leaving 72 manuscripts that were identified from the comprehensive database search. We read the titles of these articles specifically identify papers that looked at EDS and its impact on day to day life of patients suffering from. This eventually yielded the selection of 5 number of articles from their respective databases.
Conclusion: All of the included studies point towards a growing evidence that there is a strong correlation between EDS and OSA and how EDS affects the course of disease. Some negative effects of OSA are reduced productivity, cognitive dysfunction, frequent awakenings, disrupted sleep, irritability, judgment error and increased accident rates. OSA related EDS is related to neurocognitive function. Therefore, patients often have difficulty in concentrating and paying attention for long periods of time. Fine-motor coordination also gets affected.
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0503
THE IMPACT OF HEALTH DISPARITIES ON ACCESS TO CARE FOR OBSTRUCTIVE SLEEP APNEA PATIENTS: A RETROSPECTIVE STUDY

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Introduction: Health disparities among sleep medicine patients can further worsen sleep-related breathing disorders. Sex, race, and insurance were analyzed to find association with access to care in patients with obstructive sleep apnea (OSA).
Methods: Inclusion criteria resulted in 11,896 adults aged 18 years or older through the years of 2015-2019 with diagnosis of OSA, snoring, hypersomnia, sleep related hypoventilation, or central sleep apnea. Multiple logistic regression models were used to examine significant correlates of outcomes.
Results: About 56% female and 57% black patients had a revisitation within one year, while 52% male (51.8%) and 49% white patients did so. Patients with Medicaid insurance (59%) had a higher percentage of revisitation within one year than those with HMO/PPO/EPO insurance (51%, p <.0001). These factors remain significant in the multiple logistic regression model. The average gap between visits for Medicaid patients was 72 days whereas the gaps for HMO/PPO/EPO and Medicare patients were 82 and 88 days, respectively. The odds of having a shorter gap between visits were 20% higher among Medicaid patients (odds ratio [OR], 1.20; 95% confidence interval [CI], 1.06 - 1.35), and 17% lower among Medicare patients (OR, 0.83, 95% CI, 0.73-0.94), when compared to the odds among HMO/PPO/EPO patients. No significant differences in the average gap between visits were observed across different sex and race groups.
Conclusion: Sex, race, and insurance type were significantly associated with repeated visits within one year of initial visit; insurance type was further found to be associated with a shorter gap between visits. Policy to promote access to OSA care shall address these disparities. Ethnicity, age, and surgical procedure data will be additionally analyzed.
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0504
UNRAVELING THE RELATIONSHIPS BETWEEN CHRONIC ILLNESS, HEALTHCARE ACCESS, AND OBSTRUCTIVE SLEEP APNEA IN NIGERIA

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Introduction: Diagnosing Obstructive Sleep Apnea (OSA) in the wider population in Sub-Saharan Africa is challenging, while co-morbidity with other chronic illnesses and Cardiovascular disease is still unestablished. For the few individuals with established sleep disorders and chronic illness, poor health-seeking behaviour has contributed to this gap. This population-based survey assessed associations between chronic illness, healthcare access and OSA in Nigeria
Methods: A cross-sectional study was conducted among 2388 respondents in North Central Nigeria using the STOP-BANG Questionnaire (ESQ) tool and Epworth Sleepiness Scale (ESS). A multistage sampling technique was used. Data collected was analyzed using SPSS IBM V.23. Descriptive and inferential statistics to test associations between categorical variables were analyzed. The level of statistical significance was set at $p< 0.05$ at 95% confidence level Ethical approval (ERC/MOH/2023/11/164) was obtained from the Ethical Review Committee of the Kwara State Ministry of Health.
Results: Of 2388 respondents, 683 (28.6%) were less than 50 years old, and 18.2% reported chronic illness, with hypertension being the most reported (59.1%). About 92% of those with chronic illness were on medications, and only 40.7% accessed hospital follow-up. About a third (33.3%) reported that the chronic illness affected their daily work and activities. Following medical measurement, 8.5% were underweight, 21.2% overweight, and 11.4% obese. About 16.6% had elevated diastolic blood pressure, while 21.9% had elevated systolic blood pressure. Of the respondents who reported sleep problems, SBQ classified 50% of them as having moderate to high risk of OSA ($p< 0.001$). There were significantly higher risks of sleepiness and OSA among the respondents who reported having chronic illness in both ESS ($p=0001$) and SBQ ($p< 0.0001$) scales. Similarly, high blood pressure and obesity were significantly associated with a high risk of sleepiness and OSA in SBQ ($p=0.001$) and ESS($p=0.004$) scales respectively. The SBQ scale also revealed a significantly lower health facility utilization rate among respondents with a high risk of sleepiness ($p< 0.001$)
Conclusion: There is a higher risk of sleepiness and OSA among the Nigerian population with chronic illness, many of whom have low healthcare access. This poses the danger of undiagnosed and iceberg phenomena in diagnosing OSA in low-resource settings.
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0505

EMPOWERING OSA CARE: PATIENT PROFILES AND TREATMENT PATTERNS IN JAPAN

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Introduction: In Japan, the estimated prevalence of OSA is around 15%, and about 20% of adult males and 10% of postmenopausal women are estimated to have moderate-to-severe OSA. Despite the high prevalence, few studies have assessed the patient journey from sleep test to diagnosis and treatment initiation. This study aims to assess the patient journey and the associated real world treatment pathways.
Methods: This study utilized the retrospective longitudinal real-world Japan Claims database, standardized to the Observational Medical Outcomes Partnership Common Data Model (OMOP CDM) from January 1, 2017, to May 31, 2022. The data encompassed patient demographics, OSA diagnoses, sleep study records, and treatment details. Adults over 18 with a minimum of 6 months of enrollment pre-diagnosis or treatment initiation were included.
Results: Of the 17,631 adults with OSA, 70.5% were aged 40-59, and 83.6% were male. Overnight polysomnography was used to diagnose 91% of the cases. All patients had at least one BMI reported within 1 year of OSA diagnosis with 9,185 adults (52.1%) having BMI >=25.0 kg/m^2. Dyslipidemia and hypertension were present in 19.2% and 18.5% of patients, respectively. The mean time from the first sleep study to OSA diagnosis was 7 months (SD: 16.8). 9,522 patients received OSA treatment, with 75% aged between 40-59 years and a male predominance of 92.8%. Mean time from OSA diagnosis to treatment was 3.5 months (SD: 5.1). Majority (98.6%) received Positive Airway Pressure (PAP) therapy as the primary treatment. Bariatric and upper airway surgeries were less common. PAP adherence within the first year after treatment initiation was higher amongst patients with obesity (93.1%) compared to those without (82.7%), with mean time on therapy being approximately 11.8 months (SD:0.2).
Conclusion: Our study highlights a significant prevalence of OSA, especially among middle-aged males and individuals with higher BMI. PAP therapy emerges as the primary OSA treatment with consistent adherence within the first year of treatment. Further research is needed to better understand the treatment outcomes and the unmet needs with the current standard of care for people living with OSA and Obesity.
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0506

PRACTICE PATTERNS OF SLEEP DISORDERS DIAGNOSES IN A STATEWIDE HEALTH SYSTEM: AN ELECTRONIC HEALTH RECORD ANALYSIS

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Introduction: A substantial proportion of medical care is delivered through hospital networks and health systems. Yet relatively little is known about how sleep disorders are managed from a health systems perspective. Such insight is vital to improve population sleep health. The purpose of this study was to characterize sleep disorder practice patterns within a statewide health system.
Methods: The University of Maryland Medical System (UMMS) is comprised of 13 largely autonomous hospitals that function in a decentralized manner. Four UMMS hospitals feature sleep centers. In this study, patients diagnosed with sleep disorders (January 1 – December 5, 2023) were identified using the UMMS electronic health record (EPIC). Demographic information was obtained from the EHR. Sleep disorders were identified based on ICD-10 diagnostic codes assigned within the EHR. Descriptive statistics were used to characterize sleep disorder diagnoses at the system and hospital levels.
Results: Of UMMS patients seen during the study period, 5.8% of individuals (up to N=65,095) were diagnosed with sleep disorders. The two most common sleep disorders were obstructive sleep apnea (OSA; n=36,130 patients) and insomnia (n=20,280).

Others included restless legs syndrome (n=3744), hypersomnia (n=1959), parasomnias (n=816), circadian rhythm disorders (n=532), narcolepsy (n=397), central sleep apnea (n=342), and periodic limb movement disorder (n=175). The highest numbers of sleep disorder diagnoses occurred at hospitals with sleep centers. Multiple points of care had zero diagnoses for common sleep disorders. In terms of sociodemographic characteristics, the ratio of OSA vs insomnia differed between Black and White adults.

Conclusion: Sleep disorders are commonly diagnosed in a statewide health system, with substantial variation between hospitals and points of care. Potential disparities were observed in the ratio of OSA vs insomnia diagnoses between Black vs White adults, suggesting possible underdiagnosis of insomnia among Black adults and an important topic for future research. Health systems leaders should consider system and hospital-level approaches including increasing provider awareness and leveraging telehealth and technology to improve outcomes for patients, providers, and health systems.

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0507

A NOVEL MACHINE LEARNING MODEL TO PREDICT OBSTRUCTIVE SLEEP APNEA USING CRANIOFACIAL PHOTOGRAPHY WITH QUESTIONNAIRE

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Introduction: Obstructive sleep apnea (OSA) is a complex and heterogeneous sleep-related breathing disorder, associated with systemic consequences such as hypertension, stroke, and cardiovascular diseases. Although initial screening tools such as STOP-BANG or the Berlin questionnaires have been developed, it is still challenging to capture the wide spectrum of the condition alone. Besides the questionnaires including clinical presentations, craniofacial abnormalities are also recognized as an important risk factor for detecting OSA. Herein we aim to develop an efficient approach to predict the risk of having moderate to severe OSA using machine learning techniques by incorporating anatomical information from 2D photographs.

Methods: This retrospective analysis included 348 patients, who completed answering the STOP-BANG questionnaires and took facial images at Dankook University Medical Center in South Korea between 2012 and 2022. A 1:1 Random under-sampling (RUS) method was applied to solve the imbalance problem between moderate to severe OSA cases (Apnea-Hypopnea Index ≥15 events/hour) and control. Balanced data were randomly divided into two data sets (training and validation: 80%; testing: 20%). We performed leave-one-out cross-validation (LOOCV) to seek the optimal parameters to improve the model performance and generalization using four machine learning models (logistic regression, random forest, support vector machine, XGBoost) in the training set. Thereafter, we adopted the model with the highest area under the receiver operating characteristic (AUROC) in the testing set. Finally, we evaluated the importance of each input feature in assessing OSA risk by calculating the Shapley additive explanations (SHAP) values.

Results: The logistic regression model achieved the best AUROC of 94.1% for predicting moderate to severe risk OSA. The value of craniofacial images built from deep learning algorithms was found to be a predominant contribution in the risk screening models of OSA with the aforementioned levels of severity.

Conclusion: The results of the study suggest that the proposed model improved the diagnosis of patients with moderate to severe OSA based on the combination of sleep-related questionnaires and 2D facial images by identifying the risk factors more efficiently.

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0508

AGE-RELATED DISPARITIES IN SLEEP APNEA DIAGNOSIS: IMPLICATIONS OF 4% VS. 3% HYPOPNEA SCORING CRITERIA

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Introduction: The distinction between mild, moderate, and severe apnea is crucial, as it classifies patients into different categories of modifiable risk factors. In hypopnea scoring, Centers for Medicare and Medicaid Services use the 4% criterion, differing from American Academy of Sleep Medicine 's 3%, affecting AHI measurement and the assessment of apnea severity. This study examines age-related differences in the application of these two criteria leading to different apnea severity diagnosis and to potential under-treatment, especially in the elderly.

Methods: An FDA-cleared home sleep test (SleepImage Ring 2.3.0) was utilized with clinical diagnosis involving a comprehensive review by a Board-Certified Sleep Medicine Physician. Descriptive statistics and the chi-square test were employed to assess differences in frequencies. The Bland-Altman method was used to evaluate the difference in AHI estimation between the two scoring criteria, calculating the mean difference (bias) and 95% limits of agreement.

Results: In total, 1,021 subjects (mean age 53.3±14.7 years) were analyzed. The Bland-Altman plot revealed the average bias was 8.76 (95% CI: 8.46-9.06), with the 3% criterion yielding higher values. In subjects aged 18-30 years, the most significant discordance was for the diagnosis of mild OSA (35.8%), diagnosed as normal by the 4% criterion. Interestingly, this criterion classified 2.5% of subjects as normal who were moderate by the 3% criterion. Similarly, in subjects aged 41-50 years, the greatest discordance was for mild OSA (29.8%), and 24.9% were classified as having moderate OSA by the 3% criterion but mild by the 4% criterion. For subjects aged 51-60 years, the greatest discordance was in subjects classified as having moderate OSA by the 3% criterion but mild by the 4% criterion (29.4%), and the agreement on normality was very low (6.3%). The last two age groups (61-70 and >70 years) showed a pattern of concordance/discordance very similar to that of subjects aged 51-60 years.

Conclusion: Our study unveils notable disparities in hypopnea scoring criteria (4% vs. 3%). Over 20% of individuals aged 70 and above with OSA may be under-treated using the 4% criterion,

emphasizing the necessity for nuanced OSA diagnosis in older individuals to ensure precise care.
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0509

ASSOCIATION BETWEEN ACCESS TO SLEEP CARE AND ACUTE CARE UTILIZATION: A PRELIMINARY ANALYSIS

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Introduction: Obstructive Sleep Apnea (OSA) has been linked to increased cardiopulmonary morbidity and mortality, as well as acute care healthcare resource utilization (HCRU; emergency department [ED] visits and hospitalizations). The purpose of this study was to test the hypothesis that access to OSA care was associated with decreased acute care HCRU in the state of Maryland.
Methods: The University of Maryland Medical System (UMMS) is comprised of 12 autonomous hospitals that function in a decentralized manner. Patients (N=31,477) were identified within the UMMS electronic health record system based on ICD-10 code for OSA (G47.33). Access to care was defined based on the number of AASM-accredited sleep centers in the five main regions of Maryland. Acute care HCRU was defined based on rates of ED admissions and inpatient hospitalizations from January 1st, 2023 to December 5th 2023 in each of the 12 hospitals and main regions of Maryland.
Results: The final sample included 31,447 patients diagnosed with OSA. At the individual hospital level, the highest rate of ED admissions was observed within a suburban hospital (7.79%). The highest rate for inpatient hospitalizations was observed within an urban hospital (6.47%). At a regional level, the Central Maryland region (seven hospital sites) showed the highest average rate of ED admission (3.78%) and inpatient hospitalizations (2.98%). Notably the Central Maryland region also had the largest number of AASM-accredited sleep centers (n=14) compared to other Maryland regions, suggesting a positive association between access to OSA care and acute care HCRU. From a socioeconomic stand point, Central Maryland average median household income was only the third highest ($96,128).
Conclusion: Contrary to our hypothesis, access to OSA care was associated with increased acute care HCRU among individuals with OSA in a statewide health system. The most likely explanation for this finding is a higher number of OSA diagnoses around sleep centers which are regionally clustered and possible regional differences in patient population. Future research should seek to improve OSA management and reduce acute care HCRU.
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0510

ETCO2 SCREENING FOR OBESITY HYPOVENTILATION SYNDROME: A PATIENT SAFETY AND QUALITY IMPROVEMENT STUDY

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Introduction: Obesity hypoventilation syndrome (OHS) is a disorder of daytime hypercapnia which worsens during sleep. OHS may be underdiagnosed yet has an insidious progression to significant cardiopulmonary and neurologic morbidities and increased mortality. End-tidal carbon dioxide (ETCO2) monitoring is not routinely obtained in adult patients undergoing in-lab diagnostic polysomnography (PSG), possibly contributing to underdiagnosis. Patients with OHS may be missed without initial screening and consideration for this diagnosis. This quality improvement project sought to estimate the incidental rates of OHS in obese patients and describe their clinical characteristics.
Methods: Patients presented to our academic sleep center from September – November 2023 for clinically indicated diagnostic PSG. Those with a body-mass index (BMI) greater than 30 kg/m2 underwent ETCO2 monitoring during their PSG. Those with a documented history of opioid use, primary pulmonary or neurologic disease were excluded. Basic demographics and sleep screening questionnaires were obtained.
Results: Initial data revealed 43 eligible patients. 21% (n=9) of patients met the International Classification of Sleep Disorders (ICSD) Third Edition Text Revision diagnostic criteria for OHS. There was no statistical difference between the OHS group and the non-OHS group in the following categories: Male (77.8% v 76.5%), Age (33.8 v. 33.6), BMI (33.2 v. 33.8), AHI (23.6 v. 22.9), and ESS (12.8 v. 12.3). Of note, ISI scores were significantly different (15.9 v. 16.9, p=0.04).
Conclusion: Implementing an OHS screening protocol is a quick, feasible way to improve diagnosis of OHS. The incidental discovery of OHS was found to be clinically meaningful. Given the relatively low BMI, this may be an underestimation of OHS prevalence in obese patients. To the authors knowledge, no published improvement projects exist for improving diagnosis of OHS with routine PSG in an outpatient setting.
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0511

HIGH FREQUENCY RADAR FOR NON-CONTACT DETECTION OF RESPIRATORY SIGNALS DURING SLEEP

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Introduction: Polysomnography (PSG) requires on-body sensors for respiratory effort measurement, that can adversely affect sleep quality and accuracy of detection of sleep related breathing disorders (SRBD). We developed a non-contact 60 Hz pulsed wave radar system with integrated advanced signal processing to collect respiratory effort, heart rate and gross body movements

data using phase differencing to a sub-mm resolution. In this study we tested the performance of this system in detecting SRBD events against standard PSG in human participants.
Methods: During participants' clinically indicated PSG, we collected concurrent data from the radar system placed under the bed on a tripod mount. Algorithms were developed to quantify breath amplitude reductions collected by radar and compared to the time-synced signals derived from respiratory impedance plethysmography belts. A Convolutional Neural Network (CNN) was trained on radar in-phase/quadrature (I/Q) data for each 30 second epoch to output probability of apnea and hypopnea events using standard event definitions. Receiver Operating Characteristics (ROC) plot and confusion matrix for the trained network were generated to provide accuracy of event predictions.
Results: A total of 60 participants completed the study. The participants had a mean age of 65 years (Inter Quartile Range 13.5 years), and 56% subjects were male. The mean AHI for the entire cohort was 12.9 (IQR 14.75) events/hour. ROC plots showed an Area Under the Curve (AUC) of 0.98 for events detection by radar compared to human scored PSGs. The confusion matrix was generated at an operating point of 95% sensitivity and 80% specificity.
Conclusion: The non-contact high frequency radar system showed excellent performance in respiratory event detection in patients with sleep-related breathing disorders in comparison to the gold standard PSG system. Use of this technology is expected to reduce the number of body contact sensors used during conventional sleep studies and thus improve patient comfort and accuracy of results.
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0512

ABED: AUTOMATIC SLEEP-DISORDERED BREATHING EVENT DETECTION

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Introduction: Sleep disordered breathing (SDB) affects more than 10% of the global population and is associated with cardiovascular diseases. Manual annotation of SDB events is time consuming and suffers from inter-rater variances and biases. We propose Automatic Sleep-Disorder Breathing Event Detection (ABED), a method capable of localizing and classifying obstructive apneas (OA), central apneas (CA), and hypopneas (HYPO).
Methods: ABED was trained on 5,456 PSGs and evaluated on 1,099 PSGs from 4 different cohorts. The respiratory modalities included measures of nasal flow, oral thermistor, thoracoabdominal plethysmography, and blood oxygen saturation. These were passed directly as input for ABED. EEG and EOG were passed through another automated detector to ascertain arousals and wake probabilities, which was also passed as input. ABED uses an end-to-end deep learning architecture based on state-of-the-art object detection methods Unified-Real-Time-Object-Detection, ResNet for feature extraction and bi-directional long-short-term-memory layers for temporal processing. ABED was trained on 240 second windows and apnea classes were balanced by sampling less prevalent classes (OA, CA) multiple times during training. ABED was optimized based on event class (cross-entropy loss) and position (Huber loss) weighted towards the class. At the point of inference, non-maximum suppression was used to remove overlapping predictions.
Results: Results show that the apnea-hypopnea index (AHI) values based on ABED's predictions correlate well with experts ($R^2=0.86;\beta_0=0.95,\beta_1=3.29$) and predict sleep apnea diagnosis (AHI≥15) and severity (no, mild, moderate, severe) with a mean accuracy of 89% and 76%, respectively. ABED was able to predict the central apnea index (CAI) with a high correlation ($R^2=0.82;\beta_0=1.16,\beta_1=0.51$). When inferring individual events, ABED achieved an overall F1 score of 0.78 in distinguishing between the presence of an event or regular breathing. For specific event types, the F1 scores were: 0.72 OA, 0.51 for CA, and 0.66 for HYPO.
Conclusion: ABED was trained and tested on a multi-cohort dataset and demonstrates generalizing properties on intra-cohort variability along with consistent scoring, making ABED suitable as support for medical experts in SDB annotation. Overall apnea event detection performance demonstrates that ABED can discern between apneic events and regular breathing. Additional work will involve integration of additional cohorts.
Support (if any):

Abstract citation ID: zsae067.0513

0513

ASSESSMENT OF SLEEP FRAGMENTATION IN A LARGE US SAMPLE BY HOME UNDER-MATTRESS DEVICES

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Introduction: Sleep fragmentation by arousals and sleep-disordered breathing (SDB) is known to increase with age and differ by gender, although the magnitude of these effects is largely unknown. Population studies allow large collection of continuous nightly data to explore these effects.
Methods: Sleep fragmentation index (SFI, arousals/hour) and SDB were analyzed by a commercially available home monitoring device (Sleeptracker-AI Monitor, Fullpower Technologies Inc., California, USA) that passively monitors sleep using piezo-electric sensors. Validated sleep/respiratory parameters were derived from device data. De-identified data were analyzed, following review and exemption of the study (#57681) from Stanford University IRB. SFI was assessed using an estimated arousal index, estimating individual arousal events from passive sensor data, with validation against PSG. Data 8/16/2023-12/15/2023 were reviewed. Individuals with birth year and gender provided and age 20-79 years in 2023 were included in the analytic dataset.
Results: 117,846 individuals (64,049 men, 48.2±12.6 years; 53,797 women, 48.3±12.6 years) with 10,090,778 recorded nights met the inclusion criteria. For AHI< 5, the SFI mean±SE for women and men were 13.6±0.16 and 12.6±0.13 at 20-24 years, respectively, and increased with age to 15.0±0.26 and 16.0±0.24 for 75-79 years. For AHI< 5, men showed a significantly greater SFI during REM sleep than women across all ages above 24 years, but not during NREM sleep. For AHI<

5, SFI significantly increased with age during NREM sleep (women 11.9±0.15 to 14.6±0.17, men 10.8±0.12 to 15.1±0.26), but for REM sleep increased up to 25-34 years (women 18.8±0.12, men 19.6±0.09), but then steadily decreased with age to 75-79 years (women 16.1±0.27, men 18.1±0.24), and a similar trend was found for AHI≥5. For AHI≥5 compared to AHI< 5, SFI was significantly higher by 6-13 arousals/hour across all ages.
Conclusion: Use of a noninvasive in-home monitoring device enabling continuous nightly collection/analysis of a large sample of sleep/respiratory data revealed differences in sleep fragmentation across age and by gender. Greater sleep fragmentation was observed for men across age during REM sleep, and fragmentation during REM sleep decreased with age after 34 years, which is unexpected and warrants further study given that overall quantities of NREM and REM sleep decrease with age.
Support (if any): Fullpower

Abstract citation ID: zsae067.0514

0514
CAN THE PPG CARDIAC COMPONENT ENVELOPE REFLECT THE RESPIRATORY DRIVE?

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Introduction: Using a home-based fingertip monitor can decrease the time and cost of screening obstructive sleep apnea (OSA). During OSA events, respiration is partially or totally blocked, which stimulates the compensatory respiratory drive. We discovered a significant cardiac component envelope dynamics induced by the apnea events, particularly a strong surge following most apnea events. We conjecture that it reflects the respiratory drive.
Methods: We recruited 76 participants with suspected OSA. Each participant attends overnight PSG analysis with the TipTraQ device, which is installed in the fingertip with red, infrared and green photoplethysmography (PPG). Sleep apnea events were labeled by the same sleep experts. The envelope of the cardiac component (EC) and the instantaneous heart rate (IHR) were extracted from each PPG channel. The surge in the EC and IHR near the end of each OSA event was extracted by the spectrum analysis. The lag seconds of the surge after each event, latency between the EC surge and the IHR surge, and maximal shifted correlation coefficient were evaluated.
Results: During periods of frequent OSA, the EC surge and the IHR surge are well-aligned. The correlation coefficient is over 0.8 with the EC surge shift of about 4 seconds forward. The lag seconds are distributed from 10 to 40 for both channels' surges, central at 25. The age does not affect distributions.
Conclusion: The study results show that after OSA events, the EC surges often happen after IHR surges. This suggests that the sympathetic stimulation induced by OSA happens earlier than hemodynamic changes reflecting respiratory efforts, especially when participants enter the frequent OSA periods state, which further suggests that EC encodes respiratory drive. This observation could help better determine whether a patient is suffering a severe apnea from the mobile fingertip devices like TipTraQ.
Support (if any):

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0515
DEMOGRAPHIC STUDY OF INPATIENT POLYSOMNOGRAPY FROM 2019 THROUGH 2022

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Introduction: Sleep disordered breathing (SDB) refers to abnormalities in ventilation and oxygenation that occur during sleep. Common etiologies of SDB include obesity, craniofacial abnormalities, neuromuscular disorders, and adenotonsillar hypertrophy. The gold standard for diagnosis of SDB is polysomnography (PSG) which evaluates for obstructive sleep apnea, central apnea, persistent desaturations, nocturnal hypoxia, or to determine readiness for decannulation from tracheostomy, and can be performed in either the outpatient or inpatient setting. The primary objective of this study is to determine any temporal changes in patient demographics, PSG parameters, and prevalence of airway comorbidities among pediatric patients receiving at least one inpatient PSG during the COVID19 pandemic, from 2019 through 2022.
Methods: Retrospective analysis of medical records from 422 pediatric patients admitted to Children's Hospital in Dallas from 2019 through 2022 who received at least one PSG was conducted. Parameters from PSG were recorded and analyzed. Values and demographics from each year were compared against each other and analyzed.
Results: A total of 422 children had 467 PSGs from 2019 through 2022. Demographically, there was no difference in age, gender, height, weight, race, ethnicity, language spoken at home, or primary insurance over these years. In terms of PSG parameters, there was a significant difference in AHI between 2019 12.83(95%CI 9.33-16.32) and 2022 19.04(95%CI 12.39-25.69, $p< 0.05$) as well as percentage of total sleep time spent hypercapnic between 2020 9.78%(95%CI 5.09-14.48%) and 2022 4.90%(95%CI 1.55-8.24%, $p< 0.01$). There was no difference among prevalence of airway comorbidities. There was also a significant difference in hospital stay between children hospitalized in 2019 15.29(95%CI 12.06-18.52 days) compared to 2020 25.98(95%CI 18.10-33.85 days, $p< 0.05$), 2021 29.74(95%CI 19.00-40.48 days, $p< 0.05$), and 2022 31.24(95%CI 24.04-38.44 days, $p< 0.001$).
Conclusion: Hospitalized pediatric patients in 2019 prior to the onset of COVID19 pandemic had shorter hospital stays compared to 2020, 2021, and 2022. The longer length of hospital stay observed in 2020-2022 likely reflected initiatives to limit inpatient PSGs in favor of performing them in the outpatient setting. Further research comparing the specific management by PSG metrics would provide insight on changes in treatments for SDB throughout the COVID19 pandemic.
Support (if any):

Abstract citation ID: zsae067.0516

0516
ALICE NIGHTONE™ VS WATCHPAT ™: HOW DO THESE TWO HOME SLEEP APNEA TESTS COMPARE TO ONE ANOTHER?

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Introduction: Home sleep apnea testing allows patients to test and receive prompt treatment for obstructive sleep apnea (OSA). We wanted to compare a traditional device such as the Alice NightOne™ to a newer device called WatchPAT™.
Methods: We looked at 119 studies using Alice NightOne™, as well as 120 studies using WatchPAT™. We compared the results of the two devices with the goal of calculating the total positive and negative results, the severity of sleep apnea, and the number of patients who were started on treatment. Sleep apnea severity was classified as mild, moderate, and severe.
Results: Of the 119 patient who underwent Alice NightOne™, 78.15% (93/119) had OSA. There were 66 females and 53 males, with an average age of 49.08 years, BMI of 35.20 kg/m2 and ESS of 8.2. Of the patients diagnosed with sleep apnea, 48.39% (45/93) were diagnosed with mild OSA, 22.58% (21/93) with moderate OSA and 29.03% (27/93) with severe OSA. 54.84% (51/93) patients were treated with CPAP therapy, while 21.51% (20/93) patients were recommended to have a titration study and 23.66% (22/93) patients were lost to follow up. Of the 120 patients who underwent WatchPAT™ study, 70.83% (85/120) had OSA. There were 56 females and 64 males, with an average age of 46.04 years, BMI of 35.99 kg/m2 and ESS of 9.1. 42.35% (36/85) were diagnosed with mild OSA, 21.18% (18/85) with moderate OSA and 36.47% (31/85) with severe OSA. Of the 85 patients who were diagnosed with sleep apnea, 87.06% (74/85) patients were treated with CPAP therapy, while 3.53% (3/85) patients refused therapy and 9.41% (8/85) patients were lost to follow up.
Conclusion: Based on the results of testing, we found that the diagnostic utility between the two modalities was comparable. WatchPAT™ was able to identify 70.83% of patients with OSA, while NightOne™ was able to identify 78.15%. Of the patients identified with sleep apnea, 54.84% of patients undergoing NightOne™ were started on CPAP therapy and 87.06% of patients undergoing WatchPAT™ were started on PAP therapy.
Support (if any):

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0517

INTEGRATING BODY SENSOR INTO A WEARABLE PLATFORM TO ENHANCE THE IDENTIFICATION OF CENTRAL AND MIXED APNEAS

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Introduction: Accurate identification of apnea types is crucial for effective diagnosis and management of sleep-disordered breathing. The Belun Sleep System (BLS-100, a.k.a., Belun Ring) is an FDA-cleared home sleep apnea testing system (K222579) comprising an adjustable ring-shaped wearable, a cradle, and two deep learning-powered algorithms. The Belun Cor, a novel subxiphoid sensor equipped with accelerometry, can detect respiratory effort, respiratory rate, body position, and facilitates the detection of central events. This preliminary analysis aims to assess the performance of the integrated BLS-100 in detecting apnea events containing central components.
Methods: This interim analysis evaluated the performance of BLS-100 in a clinical cohort of hospitalized patients admitted for acute ischemic stroke. Eligible patients underwent in-lab polysomnography (PSG) alongside concurrent BLS-100 testing. PSG scoring adhered to the latest AASM scoring manual, with scoring technicians blinded to the BLS-100 results. The BLS-100 derived total sleep time (bTST), sleep stages (bSTAGE), apnea-hypopnea index (bAHI), and combined central and mixed apnea index (bCMAI).
Results: As of 12/17/2023, 25 consecutive Taiwanese patients were enrolled. Four patients were excluded due to short bTST< 120 mins. The analysis was conducted on 21 patients. M:F 19:2; age 59.7; PSG TST 270 ± 61.9 mins; PSG AHI 27.0 (1.4-81.9) with 3 normal, 3 mild, 7 moderate, and 8 severe OSA cases. The mean PSG central apnea index (PSG-CAI) was 4.8 (0.0-34.0), with 5 patients having PSG-CAI≥5. The mean PSG central and mixed apnea index (PSG-CMAI) was 8.4 (0.0-47.3). Pearson correlation coefficients between PSG-CAI and bCMAI, as well as PSG-CMAI and bCMAI, were 0.939 (P< 0.001) and 0.982 (P< 0.001), respectively. Using bCMAI≥5 to predict PSG-CAI≥5, the accuracy, sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and Cohen's Kappa were 0.81, 1.00, 0.75, 0.56, 1.00, and 0.59, respectively. Similarly, using bCMAI≥5 to predict PSG-CMAI≥5, the corresponding values were 0.86, 0.88, 0.85, 0.78, 0.92, and 0.70, respectively.
Conclusion: Early findings indicate that the BLS-100 with Belun Cor shows promising performance in identifying apnea events that include central components. An elevated bCMAI serves as a valuable indicator for clinicians, signaling the presence of central or mixed apneas.
Support (if any): Case Western Reserve University-Taipei Medical University Pilot Award

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0518

LONGITUDINAL TESTING WITH A HOME SLEEP APNEA TEST SHOWS LARGE VARIABILITY IN NIGHTLY SLEEP APNEA SEVERITY

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Introduction: Sleep apnea (SA) is traditionally diagnosed by a single-night sleep study, however research suggest that nightly variability in SA severity is common. The purpose of this study was to utilize a novel longitudinal home sleep apnea test (HSAT) to evaluate the extent of variability and identify the ideal number of tests for diagnostic accuracy.
Methods: This study retrospectively evaluated 149 adults across the U.S. that used a novel type-3 HSAT, capable of unlimited longitudinal testing. 1,184 tests were evaluated (Mean 7.9 tests/subject; SD 6.9). Subjects who reported using SA treatments were removed from analysis. Apnea/Hypopnea Index (AHI) was assessed to determine the presence and severity of SA. A subgroup of previously diagnosed individuals were assessed for accuracy of their original sleep study.
Results: On repeat testing, 69.7% of subjects had AHI scores that varied in severity. 51% had AHIs within the normal (< 5) and abnormal range (>5). The average AHI point difference between a subject's best and worst test was 12.4 (SD 12.1). Of the subjects that were positive for SA, 52% had false negatives on their first test. An average of 3.2 (SD 1.6) test were completed before obtaining a positive AHI, and 3.6 (SD 2.2) tests before

arriving at the highest recorded severity. 26.1% of previously diagnosed subjects had HSAT-results that were more severe than their original diagnosis. Of the subjects that reported having mild SA, 11% had HSAT scores in the severe range. Of the subjects that reported having moderate SA, 38% HSAT scores in the severe range. Factors that were found to correlate with AHI variation were variation in time spent in supine position and time spent in REM.
Conclusion: Longitudinal testing with an HSAT confirmed high night-to-night variability of AHI in the majority of subjects. Subjects with mild to moderate SA were at high risk for misdiagnosis or misclassification if diagnosis is based on single or double night sleep studies. This study emphasized the need to standardize longitudinal testing and suggests that >3 tests is ideal for diagnostic accuracy.
Support (if any):

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0519

PREDICTORS OF FALSE NEGATIVE HSATS IN A VETERAN POPULATION

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Introduction: Obstructive sleep apnea (OSA) is a common chronic condition associated with significant morbidity and mortality. Polysomnography (PSG) is the gold standard for diagnosis but is not always readily available. American Academy of Sleep Medicine (AASM) 2017 guidelines recommend in-lab PSG if a patient with high pretest probability of OSA has a negative home sleep apnea test (HSAT) defined as AHI < 5 events/hour. At our institution, the threshold for obtaining an in-lab PSG has been broadened to include pAHI < 10 events/hour. We investigated the validity of this threshold and analyzed co-morbidities and other predictors of false negative HSATs.
Methods: We reviewed 306 consecutive WatchPAT® (Itmar Medical, Ltd.) HSATs between January 2021 and December 2022 with a peripheral arterial tonometry–derived apnea-hypopnea index (pAHI) < 10. False negative HSAT was defined as pAHI < 10 with in-lab PSG AHI > 5 and true negative HSAT was defined as pAHI < 10 with in-lab PSG AHI < 5. The in-lab PSG results were categorized as mild, moderate, or severe OSA. Demographic data and co-morbidity information were gathered for these patients. Chi-squared test was used for statistical analysis.
Results: Demographic data were well balanced between the two groups including male gender, age, and BMI. 131 patients met criteria for in-lab PSG. Of these, 64 (49%) were false negative and 67 (51%) were true negative. Out of the false negative HSATs, 65% were mild whereas 35% were moderate or severe OSA. These false negative HSATs were significantly associated with diabetes (p=0.01), hypertension (p=0.001), and patients with hypertension taking two or more anti-hypertensive medications (p=0.001).
Conclusion: False negative HSATs were common in the evaluation of OSA in our veteran population with a notable percentage of moderate to severe OSA on in-lab PSG even when the threshold was raised to pAHI < 10. False negative HSATs were significantly associated with diabetes, hypertension, and patients on two or more anti-hypertensive medications. AASM guidelines recommend in-lab PSG for negative HSATs. Our study proposes that we should consider increasing our threshold to repeat a gold-standard in-lab PSG in patients with a pAHI < 10, especially those with hypertension or diabetes.
Support (if any):

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0520

RELATIONSHIP BETWEEN ESS AND AHI IN PSG VS. HSAT: POSSIBLE MODULATION BY SEX

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Introduction: Excessive daytime sleepiness is a major symptom of OSA. However, the relationship between Epworth Sleepiness Scale (ESS) and apnea-hypopnea index (AHI) is tenuous and may depend on whether the AHI is derived from an in-lab or at-home study. We analyzed ESS as a function of demographic variables and AHI in a group of patients evaluated with type 3 home sleep apnea test (HSAT) or in-the lab PSG.
Methods: A group of 83 HSAT patients (40 women) were matched with 83 PSG patients by race and sex. Additionally, age was matched within a decade (20-29, 30-39, etc.), and BMI was matched within ±2.5 units. ESS was regressed onto age, BMI, sex, AHI, and AHI-by-sex, AHI-by-HSAT/PSG and AHI-by-sex-by-HSAT/PSG interactions in a backward regression model.
Results: The mean AHI=18.0±20.0, 119 patients had AHI≥5.0, OSA severity was equally represented on HSAT and PSG studies (chi-square=0.51, p=0.92). ESS was negatively related to AHI (B=-0.58, SE=0.25, p=0.022); however, all three interaction terms were significant: AHI-by-sex (B=0.30, SE=0.14, p=0.030), AHI-by-HSAT/PSG (B=0.37, SE=0.14, p=0.009) and AHI-by-sex-by-HSAT/PSG (B=0.20, SE=0.08, p=0.013). Analyzing men and women separately, women evidenced a negative relationship between ESS and AHI (B=-0.29, SE=0.13, p=0.023) and a significant AHI-by-HSAT/PSG interaction (B=0.18, SE=0.07, p=0.009). Among men, no explanatory variables or interaction terms were significantly related to ESS.
Conclusion: As suggested by this limited sample, the relationship between AHI and self-reported daytime sleepiness may depend on the type of test used to evaluate the respiratory status and may also be modulated by the patient's sex. Future studies are required to elucidate the interaction between sex, AHI and the type of apnea test in the effects of these variables on subjective daytime sleepiness.
Support (if any): none

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0521

VALIDATION OF DEEP LEARNING ALGORITHM MODEL IN AUTOMATIC SCORING OF THE RESPIRATORY EVENTS IN ADULT POLYSOMNOGRAPHY

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Introduction: Background: Polysomnography (PSG) has several benefits as a conventional diagnostic tool for identifying and assessing a range of sleep disorders, with particular emphasis on obstructive sleep apnea (OSA). Nevertheless, the process of scoring raw data requires a significant amount of effort and time. Hence, the objective of this research was to assess the precision of a recently devised automated scoring system for respiratory events, using a deep learning algorithm model, in the context of people afflicted with sleep-disordered breathing (SDB).
Methods: A total of 1,000 case PSG data were enrolled to develop a deep learning algorithm. Of the 1,000 data, 700 were distributed for training, 200 for validation, and 100 (simple snoring, mild, moderate, and severe OSA; n = 25 in each group) for testing. The respiratory events scoring deep learning model is composed of five sequential layers: an initial layer of perceptrons, followed by three consecutive layers of long short-term memory cells, and ultimately, an additional two layers of perceptrons.
Results: The PSG data of 100 patients (mean age 50.59 ± 14.01 years; 55 men and 45 women; body mass index 26.30 ± 3.98) were selected for validation and testing of the deep learning model, which included simple snoring, mild, moderate, and severe OSA groups (n = 25 each). Our deep learning algorithm had a sensitivity (95% confidence interval [CI]) of 98.06 (96.64-99.53), 98.12 (96.68-99.87), 98.23 (96.75-99.72), and 98.51 (96.2-95.91) for identifying apnea or hypopnea events. The specificity (95% CI) of simple snoring, mild OSA, moderate OSA, and severe OSA was 97.79 (92.84-99.95), 96.84 (93.6-99.95), 96.7 (93.32-99.59), and 95.46 (93.71-99.08) compared to a manually graded PSG report. The deep learning model's area under the curve values for predicting OSA in apnea-hypopnea index ≥ 5, 15, and 30 groups were 0.9402, 0.9388, and 0.9442, respectively, showing no significant differences between each group.
Conclusion: The deep learning algorithm used in our work demonstrated a notable accuracy in recognizing apnea/hypopnea episodes and subsequently categorizing the severity of OSA.
Support (if any): This work was supported by the Technology Development Program (S2718665), which is funded by the Ministry of SMEs and Startups of Korea and Soonchunhyang University Research Fund.

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0522

SCREENING AND DIAGNOSIS OF OBSTRUCTIVE SLEEP APNEA IN MIDDLE EASTERN/NORTH AFRICAN (MENA) WOMEN: A PILOT STUDY

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Introduction: The risk of obstructive sleep apnea (OSA) increases with age for both sexes. Beyond chronological age, reproductive aging in women between ages of 40-60 may also raise OSA risk. Associations between reproductive aging and OSA have been infrequently explored among women from underrepresented ethnic groups. Therefore, we initiated a pilot cohort study in women from Middle Eastern/North African (MENA) backgrounds (n=77) from Southeast Michigan. To examine the frequency of OSA, we screened women with the STOP-BMI scoring scheme and then compared their risk profiles against Home Sleep Apnea Test (HSATs).
Methods: This pilot study included 77 MENA women from Michigan between the ages 40-60y. In addition to demographic, lifestyle and anthropometric data, women were also screened for OSA with the STOP-BMI questionnaire (Score >3 indicating high risk and < 3 indicating low risk). A subset of these women completed HSATs with WatchPAT® devices (pAHI 3% >5/hour defined OSA).
Results: In this sample, the mean age was 48y and a third of women were postmenopausal. Mean BMI was 27.6 and 25% of the women had a BMI>30. Twenty women underwent HSATs, and 15 (75%) showed OSA. The mean BMI of women with and without OSA was 30.6 and 26.8 kg/m2, respectively. Of the 15 women with OSA, eight scored low-risk on the STOP-BMI. Moreover, among women without OSA, 40% had a high-risk score on the STOP-BMI. Data suggested that the STOP-BMI has moderate sensitivity (47%) and specificity (60%).
Conclusion: We found a high frequency of OSA among midlife women from MENA ancestry and despite a low frequency of obesity. Moreover, the STOP-BMI screening tool for OSA was neither sensitive nor specific among these women. Our data suggest that OSA risk may be independent of BMI and that the current screening tool may not capture the symptoms and risk factors for OSA among midlife women.
Support (if any):

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0523

SCREENING FOR PREVALENCE AND PATTERN OF SLEEPINESS AND OBSTRUCTIVE SLEEP APNEA AMONG NIGERIAN POPULATION

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Introduction: Significant sleepiness and Obstructive Sleep Apnea (OSA) burden can be effectively managed in Sub-Saharan Africa (SSA) if population-based data are available. To fill this study gaps, this study piloted a screening survey in an African country using the two popular tools (Epworth and Stop Bang), translated and validated among a Yoruba-dominated diverse population of the North-Central region of Nigeria
Methods: This was a household survey among rural, urban and semi-urban populations in North-Central Nigeria. A total of 2388 eligible permanent adult residents were selected through a 4-level multistage sampling process. Epworth Sleepiness Scale (ESS) and Stop Bang Questionnaire (SBQ) were adapted, translated into the Yoruba language, and validated (face, content and construct validity). Both Descriptive and inferential analyses were presented to report the prevalence, pattern and factors associated with sleepiness and OSA. The level of significance was set at a p-value of < 0.05 and a 95% confidence interval. Ethical approval was obtained from the Kwara State Ministry of Health
Results: More than a quarter of the respondents were 50 and older, with almost equal gender representation and Yoruba tribe preponderance (87.5%). The urban (34.4%), semi-urban (33.5%) and rural (32.1%) locations were equally distributed. Using the

ESS, 15.7% had average sleepiness while 29.4% reported abnormal sleepiness. With the SBQ, 24.2% had a moderate risk of OSA while 5.6% had a high risk of OSA. The geographical pattern of OSA showed no significant distribution with ESS. Still, SBQ shows a significant (p< 0.0001) moderate (38.8%) and high risk (3.9%) of OSA among urban population than semi-urban (moderate: 25.8% vs high: 0.9%) and rural population (moderate:18.9% vs high: 0.3%). Female gender, increasing age, occupation type, low-income earning and obesity were significantly associated with average and abnormal sleepiness using ESS. While being a widow, a large household and obesity were significantly associated with OSA using SBQ.
Conclusion: Both the ESS and SBQ tools revealed a moderately high prevalence of sleepiness and OSA, with the urban Nigerian population reporting a higher prevalence. However, the two tools reported slightly varied factors associated with sleepiness and OSA
Support (if any):

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0524

BASET SCORING: A NOVEL SIMPLE BIOMETRIC SCORE FOR SCREENING AND GRADING OBSTRUCTIVE SLEEP APNEA

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Introduction: Polysomnography (PSG) is the gold-standard diagnostic tool for Obstructive Sleep Apnea (OSA). There is no diagnostic validated simple tool with clear cutoff point for predicting and roll out patient with OSA in primary care clinics significantly alters clinical outcomes. Our study aimed to assess the validity of BASET scoring as a new potential tool for screening and grading the severity of OSA patients.
Methods: After institution review board approval and formal patient consent, 144 subjects for suspected OSA and their relatives were enrolled. All subjects were subjected to a full night PSG study after history taking, sleep questionnaires, and physical examination, including BASET score components: B= Body Mass Index (BMI), A= Abdominal circumference (AC), S = Snoring, E= Epworth Sleepiness Scale, and T= Tongue teeth imprint. ROC analysis that used to assess the optimal cutoff point of the BASET score and to compare its accuracy for predicting OSA with Berlin and STOP-Bang scores.
Results: This study included 63 OSAS patients, 33 (52.38%) males and 30 (47.62%) females, and 81 controls; 22 (27.16%) males and 50 (72.84%) females. The Cronbach's alpha for the 5 BASET score components was 0.846, indicating the internal consistency reliability of the scale. Moreover, BASET score has a moderately strong positive significant correlation (r = 0.778, p< 0.001) with AHI. By ROC analysis, the accuracy of the three measures was generally high, with BASET score predicting OSA most accurately (AUC=0.984, 95%CI: 0.956–0.999), followed by STOP-Bang (AUC=0.939, 95%CI: (0.887–0.972) and Berlin (AUC=0.901, 95%CI: 0.841–0.945). The AUC of BASET score was significantly higher compared to the Berlin score (difference= 0.0825, 95%CI: 0.039–0.125) and STOP-Bang score (difference= 0.0447, 95%CI: 0.011–0.078). On the other hand, there was no difference between the AUC of Berlin and STOP-Bang scores (difference=0.0378, 95%CI: 0.006 - 0.081 4). BASET score was significantly (p< 0.001) associated with OSA grades,
Conclusion: BASET score is a convenient, reliable, and valid tool for diagnosing OSA. BASET score is more accurate for predicting OSA than Berlin and STOP-Bang scores, while there is no difference between Berlin and STOP-Bang scores. BASET score indicates OSA grades.
Support (if any): No financial support

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0525

CAN INTRA ORAL AND FACIAL PHOTOS PREDICT OBSTRUCTIVE SLEEP APNEA IN THE GENERAL AND CLINICAL POPULATION ?

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Introduction: Obstructive sleep apnea (OSA) is associated with upper airway soft tissue and craniofacial skeletal alterations, but if these abnormalities, using quantitative facial and intraoral photographic analysis, differ between in the general population and clinical samples were not tested yet. This study aimed to evaluate and compare measurements of standardized craniofacial and intraoral photographs between clinical and general population samples, between groups of individuals with an apnea-hypopnea index (AHI) ≥15 and AHI< 15, and the interaction between them, as well as the relationship with the presence and severity of OSA.
Methods: We used data from 929 participants from Sleep Apnea Global Interdisciplinary Consortium (SAGIC): 309 patients from a clinical setting and 620 volunteers from a general population sample.
Results: Moderate and severe OSA (AHI≥15) were observed in 30.3% of the total sample and there were some interactions between facial/intraoral measures with OSA and both samples. Mandibular volume (p< 0.01), sternomental distance (p=0.04), and lateral face height (p=0.04) were higher in the AHI≥15 group in the clinical sample compared to the AHI≥15 group in the general population and AHI< 15 group in the clinical sample. Multivariate regression suggests photography-based variables capture independent associations with OSA in both samples. When adjusted for sex and age, greater mandible width (p< 0.01) differed both in the clinical and in the general population samples, reflecting AHI severity and the likelihood of OSA; the measure of smaller tongue curvature (p< 0.01) reflected the severity and probability of OSA in the clinical sample; and the higher posterior mandibular height (p=0.04) showed a relationship with higher AHI and higher risk of moderate to severe OSA in the general population sample. However, when adjusted for sex, age, and BMI, only smaller tongue curvature (p< 0.01) was associated with moderate/severe OSA.
Conclusion: Quantitative standardized facial photographs indicated that the measures of greater tongue and mandible were associated with increased OSA risk in the clinical sample and higher facial height measurement was associated in the general population sample.
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0526

DEEP CONVOLUTIONAL NEURAL NETWORK FOR GROANING AND SNORING SOUNDS CLASSIFICATION

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Introduction: Catathrenia is a rare sleep-related breathing disorder characterized by recurrent monotonous groaning during sleep. The acoustic characteristics of groaning and snoring sounds have been investigated. This study aims to propose a deep convolutional neural network (CNN) for automatic binary classification.
Methods: This study consisted of 3728 episodes of groaning sounds and 4577 episodes of snoring sounds obtained from synchronized audio of full-night polysomnography. Four features extracted from log-scaled mel-spectrograms were used as input. The background gaussian noise and the time-shifting were used to augment the dataset. The dataset was randomly split into training (70%), validation (15%), and testing datasets (15%). A deep learning convolutional neural network architecture was trained and evaluated.
Results: The proposed CNN model achieves an accuracy of 95.0% on the binary classification of groaning and snoring sounds. The model attains a sensitivity/recall of 96.4%, a specificity of 93.4%, and an F1 score of 94.84%.
Conclusion: The proposed CNN architecture has performed well in the automatic binary classification of groaning and snoring sounds, which could reduce difficulties in acoustic analyses of groaning episode detection. The model needs to be verified with more audio data before it can be put into clinical use better.
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0527

IS INPATIENT POLYSOMNOGRAPHY ASSOCIATED WITH LIMITED HEALTHCARE ACCESS, AND ECONOMIC AND SOCIAL DEPRIVATION?

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Introduction: In Alberta Canada care and funding models for sleep-disordered breathing (SDB) are fragmented, which may delay treatment particularly for socio-economically deprived individuals and contribute to the frequency and length of hospitalization. We assessed for economic and social deprivation as well as multimorbidity among adults undergoing diagnostic polysomnography (PSG) during hospitalization compared to age and sex-matched hospitalized and ambulatory controls.
Methods: In this retrospective health administrative data study, we included all individuals undergoing PSG during a hospitalization (SDB inpatients) from January 1, 2019, to December 31st, 2021, in a large, academic hospital-based sleep center in Calgary, Canada. We created time, age- and sex-matched control groups, each with a 2:1 ratio: 1) individuals referred to the sleep center (non-acute control); 2) hospitalized individuals who did not undergo PSG (acute control). Clinical records were linked to health administrative databases of routinely collected health variables, using validated algorithms to define comorbidities, social and economic deprivation, marginalization, and rurality. Between-group differences were assessed for statistical significance using paired analysis with a significance level of 0.05.
Results: We matched 275 individuals who underwent PSG during hospitalization with 550 acute and 550 non-acute controls. At baseline, SDB inpatients had greater health care utilization and a higher prevalence of comorbidities with a median [IQR] Charlson Comorbidity index of 3 [2, 5] vs 1 [0,3] for acute controls and 1 [0,2] for non-acute controls. Compared to the acute controls, SDB inpatients did not have higher rates of social deprivation or median marginalization (3 [2, 5] vs 3 [2,5]); however, they were more likely to be receiving social assistance (24% vs 12 %) and live in urban areas (88% vs 76%). Compared to non-acute control, SDB inpatients had a higher median rate of marginalization (3[2,5] vs 3[1,4]), lower median income (48925$ [38677,61632] vs 55252$ [44745,71310], and were more often receiving social assistance (24% vs. 14%).
Conclusion: SDB inpatients have a greater burden of multimorbidity and are more socially disadvantaged by several metrics. Follow-up studies are needed to determine if an earlier diagnosis could reduce the development of medical and social complications of untreated SDB.
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0528

USE OF INPATIENT SLEEP STUDIES DECREASES TIME TO TREATMENT IN PATIENTS WITH OBSTRUCTIVE SLEEP APNEA (OSA)

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Introduction: OSA remains underdiagnosed in the general population and when left untreated, can have an effect on chronic illnesses including exacerbation of disease processes, potentially increasing hospitalization. The diagnosis of OSA in patients admitted to the hospital is important, however the time from hospital discharge to sleep study and then to OSA treatment can be prolonged. We aim to assess differences in outcomes between hospital admitted patients who undergo OSA workup during admission vs in the outpatient setting .
Methods: retrospective chart review with prospective component
Results: 65 patients included all seen by sleep medicine service while admitted to the hospital and required workup for OSA; 57 received outpatient workup- 11/57 completed their sleep study (19%), all of which were prescribed PAP therapy for OSA. 2/57 (3.5%) had subsequent follow up by 6 months. Average time to diagnosis was 46 +/- 48 days and time to CPAP prescription was 56 +/- 53 days. 8 patients underwent inpatient OSA workup. All obtained a sleep study while in the hospital within 1 day of the consult; 6/8 were diagnosed with OSA all of which had the process started for CPAP set up within 2 days of sleep study. The time to diagnosis and start to treatment process was significantly less than the outpatient group ($p < 0.05$). We are currently collecting data on long term health outcomes for these patients.
Conclusion: Inpatient sleep studies for OSA work up has the potential to decrease time to OSA diagnosis and time to treatment for patients. This new workflow may have the potential to improve long term health outcomes.
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0529

FEASIBILITY OF THE REST TRACKER PLATFORM TO MONITOR OBESE PREGNANT WOMAN FOR THE ONSET OF OSA THROUGHOUT PREGNANCY

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Introduction: OSA during pregnancy is associated with increased risk for gestational-diabetes, hypertension, preeclampsia, and eclampsia, contributing to maternal and neonatal morbidity and mortality. Furthermore, OSA increases risk of chronic cardiovascular disease, well beyond pregnancy. Studies suggest the prevalence of OSA increases during pregnancy, as maternal BMI rises. Continuous evaluation is necessary as the risk increases throughout the course of the pregnancy, however this is not currently a standard practice. Sleep specialists have not provided a specific approach to assist obstetricians addressing the OSA concern, leaving a gap in our maternal health management. REST Technologies has developed the REST-Tracker, a Remote Patient Monitoring platform for the management of OSA patients and has been funded by the NIH to assess the feasibility of using this platform in the obese pregnant population at risk of developing OSA. Here, we present preliminary data using the REST-Tracker to assess for OSA throughout pregnancy in an at-risk population.
Methods: The REST-Tracker system manages data obtained from a Ring-Oximeter worn nightly by subjects whos data is processed through the FDA cleared SleepImage ™ system, assessing for OSA, providing sAHI3%/sAHI4% metrics. Subjects recruited from a high-risk obstetrics clinic. Inclusion-criteria: BMI >27, entry < 16 weeks gestational-age, Target=30 subjects monitored nightly into and through the third trimester.
Results: To date, 23 reliable subjects, two drop-outs from miscarriages, 21 currently providing data, 9 left to recruit. Initial-BMI Ave=38 (+/-6.6), Ave Initial-GA=8.9wks(+/-2.4), Initial sAHI3%/4%= 5.3 (+/-3.1) sAHI4%=2.3(+/-2.0) average monitoring to-date=12.4(+/-5) with 0 subjects demonstrating sustained moderate (sAHI4% > 15) or severe (sAHI4% >30) OSA. None of the subjects to-date demonstrate SaO2 < 90% to any significant degree, 3 subjects had the SaO2 drop < 90% >5 min on 3 nights, only 1 had 1 night with SaO2 < 88% >5 minutes (19 minutes).
Conclusion: If successful the REST-Tracker may provide new approach, improving maternal care for this at-risk population. Additionally, it allows expedited OSA management with longitudinal guidance to assess treatment modifications, necessary in a evolving medical scenario such as the third-trimester of pregnancy. Furthermore, this approach will allow insight into the pathophysiologic relationships between OSA and conditions such as gestational diabetes and hypertension.
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0530

REM-DEPENDENT OBSTRUCTIVE SLEEP APNEA: PREVALENCE, ASSOCIATED COMORBIDITIES AND POLYSOMNOGRAPHIC CHARACTERISTICS

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Introduction: Obstructive Sleep Apnea (OSA) in the REM phase is a phenotype whose prevalence varies between 10% and 36% of patients with OSA, it is more common in women, especially those under 55 years of age. Characterized by muscle relaxation, sympathetic activation, hypoxemia and sleep deprivation, this type of OSA can increase metabolic and cardiovascular risks. This study seeks to understand, through a large population sample, how gender influences REM OSA and its relationships with other comorbidities and risk factors.
Methods: The study performed a retrospective epidemiological analysis on patients who underwent polysomnography type 1 between January and December 2020. Participants were grouped based on the presence of REM OSA or NREM OSA, considering female gender. REM-OSA was defined by an AHI ≥ 5, with the REM AHI being twice or more of the NREM AHI, with a NREM AHI < 15. Comorbidities such as hypertension, diabetes, among others, were identified through medical history. The analyzes used statistical tests such as correlations, Chi-square and Student's T test for different variables, with a significance level of 5%.
Results: The study involved 1,313 patients, 444 women and 869 men, with an average age of 47.28 years. The prevalence of REM OSA was 21.7%, women represented 50.7% of the sample. The average age of women in the REM OSA group was 48.8 years. BMI analysis showed a predominance of overweight and obesity. In the NREM OSA group, there was greater severity of apnea, associated with conditions such as obesity, hypertension and stroke, and a prolonged time with low saturation. On the contrary, the OSA-REM group showed less severity of apnea, fewer associations with comorbidities and distinct characteristics in REM sleep. However, the presence of diabetes was significantly higher in women with REM-OSA, regardless of AHI and age (9,10% versus 3,65% p 0,018).
Conclusion: The increased prevalence of diabetes in women subgroup witnh REM-OSA suggests potential implications and highlights the importance of evaluating both the presence of REM OSA and glycemic metabolism, even in female cohorts with less pronounced OSA.
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0531

IDENTIFYING AIRWAY COLLAPSE PATTERNS IN OSA USING NASAL PRESSURE SIGNAL AS A SURROGATE FOR AIRFLOW SHAPE

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Introduction: Identification of the site(s) and characteristics of upper airway collapse is important for treatment selection and optimization in patients with obstructive sleep apnea (OSA) for whom an alternative to PAP therapy is indicated. The most widely accepted approach to reliably evaluate the location and severity of upper airway collapse is through drug-induced sleep endoscopy (DISE). Analysis of airflow shapes has emerged as a potential future alternative to DISE. Specifically, prior investigations have identified associations between the contours of objective airflow measurements and DISE findings from simultaneous endoscopy. Since objective airflow measurements are not obtained during standard polysomnography, this study sought to evaluate for associations between DISE findings and nasal pressure measurements as a surrogate for airflow.
Methods: Nasal pressure measurements were obtained using a type III home sleep testing device during DISE for patients at a single institution as part of their workups for non-PAP therapy. Nasal pressure data were synchronized to endoscopic video recordings, and segments of airflow waveforms corresponding to specific DISE findings were visually screened.
Results: Twenty four adult study subjects with OSA were ultimately included in this investigation. Only a subset of previously-described airflow shape correlations were found to retain associations to DISE findings. Four airflow shape surrogates were found to consistently correlate with specific DISE findings. Findings that relied on flow amplitude were not able to be detected using other nasal pressure signal characteristics.
Conclusion: Nasal pressure signal shape has potential as a limited surrogate for airflow shape, and in this investigation it was found to retain associations to upper airway collapse patterns obtained via DISE in patients with OSA .
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0532

AN EXPLORATION OF TARGETED METABOLITES AND THEIR ASSOCIATIONS WITH SLEEP LATENCY IN PERSONS WITH OSA

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Introduction: Inflammation and oxidative stress are important pathways in the associated downstream obstructive sleep apnea (OSA)-related diseases such as cardiovascular disease and Alzheimer's. Aspartic acid, an endogenously produced amino acid with anti-inflammatory and anti-oxidative properties, may potentially impact inflammation associated outcomes. This study explored associations between sleep latency (from the Pittsburgh Sleep Quality Index) and aspartic acid. Other targeted metabolites with similar anti-inflammatory and anti-oxidative properties as aspartic acid were also explored in persons with OSA.
Methods: This cross-sectional study included 88 participants newly diagnosed and untreated for OSA that underwent an overnight in-lab or at home sleep study recruited from the Emory Mechanisms of Sleepiness Symptoms Study (EMOSS). Fasting morning blood plasma samples were collected after an overnight sleep study. A multiple linear regression model was utilized to examine the association between metabolites of interest and sleep latency, controlling for baseline covariates of age, sex, body mass index (BMI), race, smoking status, and apnea hypopnea index (AHI).
Results: The mean age was 50.1 (13.1), the mean BMI was 36.2 (9.2), mean AHI was 33.2 (26.2), and 56% were male. Almost half (43%) reported hypertension, and 6.8% reported heart failure; other demographics include 5.7% and 1.1% for stroke and myocardial infarction, respectively. We observed no statistically significant associations between aspartic acid and sleep latency. Other targeted metabolites of interest with similar properties to aspartic acid that were explored included C16 ceramides, sphinganine, and sphingosine-1-phosphate, which were also not associated with sleep latency.
Conclusion: Targeted metabolites within the inflammatory and oxidative stress pathways were not associated with sleep latency in persons with OSA. Future work should explore whether or not other inflammation or oxidative-stress related metabolites or pathways may have a role in order to improve sleep.
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0533

SLEEP SPINDLE FEATURES IN OBSTRUCTIVE SLEEP APNEA: RESULTS FROM THE SLEEP HEART HEALTH STUDY

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Introduction: Obstructive sleep apnea (OSA) is associated with altered cognitive function and dementia, but the mechanisms underlying these associations remain unclear. One proposed mechanism is that OSA, by chronically fragmenting sleep, decreases the number and activity of sleep spindles, which are important for memory consolidation. Few studies have examined sleep spindle characteristics in people with OSA and with conflicting results. This study aims to examine sleep spindle characteristics in people with and without OSA from a multicenter community-based prospective cohort study, the Sleep Heart Health Study (SHHS).
Methods: The analysis was conducted on 5804 subjects of which 2830 had no OSA (apnea-hypopnea index (AHI) < 5, 61±12 years, 65% women), and 2974 had OSA (AHI ≥5, 65±11 years, 39% women). Spindle density (n/min) and frequency (Hz) were measured during non-rapid eye movement stage 2 from the left central electroencephalographic derivation. Arousal index (AI, n/hr) was used as a measure of sleep fragmentation and Epworth Sleepiness Scale (ESS) as a measure of subjective daytime sleepiness. Linear regression models adjusted for age, sex, BMI and education level were used to compare spindle features in OSA vs non OSA, and to examine the association between spindle features with AHI, oxygen desaturation degree and duration, AI and ESS in OSA group.
Results: In fully adjusted models, spindle density was lower in OSA compared to no OSA (-0.067 spindles per minute, p=< 0.001). In OSA group, lower sleep spindle density was associated with higher AHI (β= -0.003, p=< 0.001), higher AI (β= -0.002, p=0.020) and higher ESS score (β= -0.007, p=0.007) indicating higher daytime sleepiness. Spindle density was not associated with oxygen desaturation degree or duration. Spindle frequency was similar between OSA and non OSA.
Conclusion: These findings indicate that spindle density is reduced in people with OSA compared to those without OSA,

and this reduction correlates with OSA severity (AHI) and levels of daytime sleepiness. Reduced spindle density in OSA might contribute to OSA-related cognitive impairment and future work is needed to investigate the relationship between reduced spindle density and cognitive function in OSA.
Support (if any): Center for Circadian and Sleep Medicine

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0534

THE ACCURACY OF PREDICTING SNORING FREQUENCY USING SNORING SURVEYS

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Introduction: Frequent snoring can be an indicator of sleep apnea and if left untreated, can lead to cardiovascular disease and other chronic conditions. Thus, it is crucial for health professionals to easily identify frequent snorers. Many questionnaires attempt to predict snoring frequency; however, they are lengthy, require manual scoring, and/or do not have data showing snoring predictability. Therefore, we investigated which questions from various snoring surveys best predict snoring frequency.
Methods: Seventy-two adults (60 male, 12 female; 42 ± 11 y) completed the Snore Outcomes Survey (SOS; 8 items), Pittsburgh Sleep Quality Survey (PSQI; 19 items), and the STOP-Bang survey (STOP; 8 items) before starting the study. To determine snoring frequency, subjects slept with SnoreClock, an audio-based app, for 1-7 nights (241 total nights). SnoreClock reports snoring frequency based on the cumulative minutes spent snoring out of the total recording time. Stepwise multiple linear regressions were used to identify the survey questions that best predicted mean snoring frequency.
Results: The single question that was the best predictor of average snoring frequency was from the SOS: "Please describe when you snore" [I don't snore, I snore very rarely, I snore in only certain positions, I snore most of the time, I snore all of the time] ($y=9.9x+0$; $R2=0.62$; $P< 0.001$). PSQI had two significant questions regarding sleep quality and enthusiasm to get things done ($R2=0.45$; $P< 0.001$). STOP had three key predictors: daytime sleepiness, age over 50, and observed choking/gasping during sleep ($R2=0.51$; $P< 0.001$). The model including all survey questions identified two questions as most important in predicting snoring: the STOP choking question ($\beta=23.07$) and the SOS describe snoring question ($\beta= 8.15$; $R2=0.64$; $P< 0.001$).
Conclusion: Subjects can potentially be rapidly screened for snore-related health issues by asking the singular question "Describe when you snore." This one question has an $R2=0.62$ in terms of predicting snoring frequency compared to three separate snoring surveys, and therefore may be used to accelerate patient care.
Support (if any): This study was funded by Eight Sleep, Inc.

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0535

THE RELATIONSHIP BETWEEN POSITION-DEPENDENT SNORING AND SLEEP APNEA IN HEAVY SNORERS

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Introduction: Snoring can often be one of the first signs of sleep apnea. Earlier research suggested that apneic snorers tend to be position-dependent (snore more when sleeping on their back); however, existing literature is inconsistent. Moreover, the prevalence of positional dependency among heavy snorers is not well-established. This study aims to assess the prevalence of positional dependency and how positional snoring is associated with sleep apnea in heavy snorers.
Methods: Thirty snorers (43.0 ± 12.1 y) qualified for the study by snoring >10% on one out of two screening nights measured by SnoreClock (an audio-based snore measurement app). For an average of three nights, participants used SnoreClock and wore a Home Sleep Test (HST) device (Zmachine Synergy), which recorded sleep positions using a tri-axial accelerometer and calculated the Apnea-Hypopnea Index (AHI). Snorers were categorized based on their average nightly snoring duration: mild (< 10%), moderate (10–40%), or heavy (>40%). Their nightly AHI was classified as non-apneic or apneic (mild, moderate, or severe). A night was position-dependent if snoring was reduced >50% in the lateral vs. supine position. Final classifications for positional dependency and AHI were based on the subject's mode across nights. The relationship between positional dependency and AHI was examined.
Results: Of the 30 subjects tested over a total of 81 nights, 24 were classified as heavy snorers, 5 were moderate, and 1 was light. Among the 24 heavy snorers, 83.3% (n=20) were non-positional snorers, 87.5% (n=21) were apneic snorers, and 70.1% (n=17) were both. A Chi-Square Test of Independence revealed no significant association between the apnea severity and positional dependency among heavy snorers ($\chi^2(3, N=24) = 2.4$, $p = 0.49$), suggesting that the severity of sleep apnea, as measured by AHI, shows no strong association with positional dependency in heavy snorers.
Conclusion: This study shows that heavy snorers are more likely to be non-positional, and positional dependency is not associated with apnea severity. Contradicting previous research, our results indicate that the majority of heavy snorers with sleep apnea are not position-dependent, offering more insights into sleep-related breathing patterns.
Support (if any): This study is funded by Eight Sleep Inc.

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0536

PATIENT PROFILES AND TREATMENT PATTERNS FOR OBSTRUCTIVE SLEEP APNEA (OSA) IN GERMANY: A REAL-WORLD DATA ANALYSIS

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Introduction: Obstructive sleep apnea (OSA) impacts approximately 30% of 30–69-year-olds in Germany, however comprehensive real-world data on patient demographics, diagnostic pathway, and treatment patterns, remains limited. This study aims to analyze real-world data to characterize OSA patient profiles and their treatment journey within Germany.
Methods: Retrospective longitudinal analysis of German Statutory Health Insurance claims data, including 146,227 adults (≥18 years) diagnosed with OSA between 2012-2022. Data included patient demographics, clinical diagnoses, sleep study history, and treatments. Patients had a minimum six-month enrollment prior to OSA diagnosis or treatment.

Results: An analysis of 146,227 OSA-diagnosed patients reported a mean age of 58.6 years at the time of diagnosis, with males constituting 70.3% of this population. Although a majority had missing BMI data, among those recorded, approximately one-third had obesity category II-IV. Most common OSA-related comorbidities were hypertension, dyslipidemia, cardiovascular diseases, and type 2 diabetes. Majority underwent OSA diagnostic procedures like polygraphy (89.2%) and polysomnography (29.4%). Delving into treatment sequences for 84,246 patients, PAP emerged as the predominant initial therapy in 88% of patients. Alternatives like upper airway surgery (4.1%) and lifestyle modifications (0.8%) played a secondary role in the treatment landscape. Adherence patterns, evaluated among 74,605 patients on PAP therapy, showed that 95.7% were non-adherent within 12 months post-initiation. Lastly, intervals between sleep studies, diagnosis, and treatment commencement were analyzed for 80,931 patients. On average, there was a 23.3-month gap from the initial sleep study to OSA diagnosis. However, the subsequent gap from diagnosis to treatment was shorter, averaging 8.2 months, hinting at improved efficiency in care post-diagnosis.
Conclusion: These results reveal a substantial burden of OSA , particularly in older males with metabolic comorbidities. While PAP therapy is the predominant initial treatment modality, its effectiveness is undermined by a high non-adherence rate within the first year of treatment. This high rate of non-adherence coupled with the lengthy diagnostic delays underscores critical unmet need in the current OSA treatment paradigm.
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0537

ENHANCING PAP ADHERENCE IN BLACK AND HISPANIC PATIENTS UTILIZING AN AUTOMATED TELEMONITORING INTERVENTION

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Introduction: The Tele-OSA randomized trial demonstrated improved PAP adherence in obstructive sleep apnea (OSA) patients receiving a telemonitoring intervention (automated messages triggered by low usage [U-Sleep, ResMed]). We conducted a sub-group analysis to explore the effect of the intervention in Black and Hispanic adults (B/H) compared to adults of all other races/ethnicities.
Methods: Tele-OSA (Kaiser Permanente; Fontana, CA) enrolled 556 patients with OSA [AHI≥5] newly initiated on PAP (AirSense 10, AutoCPAP) and randomized to Telemonitoring (TM) or Usual Care (UC). TM showed improved adherence compared to UC at 3 months (primary endpoint). TM was further split into two groups: those in which the intervention was discontinued per-protocol at 3 months (TM3) and those inadvertently continued indefinitely (TMC). Post-hoc analysis revealed that the TMC group maintained higher PAP adherence than the UC group over two years, while the TM3 group showed no difference from UC. In the current study, we conducted a sub-group analysis comparing adherence (mean "minutes/night" and "% days used") between B/H and all other races/ethnicities in the TMC and UC groups across four time intervals: 3-6; 6-12; 12-18; 18-24 months. Kruskal-Wallis tests were used to compare the groups at each time interval.
Results: Of the 556 trial participants (50.5±12.1 years; 58.6% male, AHI 31.9±25.8), 269 were B/H (221 Hispanic; 48 Black) and 287 were non-B/H (233 White; 39 Asian). At baseline (i.e., Usual Care) B/H adults consistently showed lower adherence compared to non-B/H over two years (min/night for each time interval: 170.9±164.7 vs 195.5±172.5; 144.2±168.4 vs 167.1±172.7; 128.0±169.3 vs 158.9±181.2; 119.5±170.2 vs 148.1±184.3). B/H TMC participants had equivalent or higher PAP use compared to non-B/H TMC participants at each interval (251.8±142.1 vs 235.2±175.77; 211.2±152.1 vs 204.9±175.3; 190.4±168.3 vs 180.3±182.5; 163.3±180.2 vs 158.9±184.9). Similar findings were seen when analyzing "% nights used".
Conclusion: Our study findings show that B/H adults had lower PAP adherence compared to non-B/H adults over a two-year period. Notably, a TM intervention effectively closed the disparity gap, resulting in similar PAP adherence levels for B/H and non-B/H adults. These findings underscore the importance of rigorously testing distance-accessible strategies to enhance PAP adherence and promote health equity.
Support (if any): AASM Foundation104-SR-13

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0538

HEALTHCARE RESOURCE UTILIZATION IN TREATED OBSTRUCTIVE SLEEP APNEA PATIENTS WITH COMORBID INSOMNIA

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Introduction: Insomnia and obstructive sleep apnea (OSA), comorbidly known as COMISA, are the two most common sleep disorders, with each impairing treatment efficacy for the other. Real-world studies on treatment of patients with COMISA are lacking, thus this study aimed to examine the clinical and economic impact of treating OSA with positive airway pressure (PAP) therapy in this population.
Methods: This retrospective study linked administrative claims data to PAP device usage data for newly diagnosed OSA patients initiating PAP (index date) between January 2015 and April 2019. Adults with evidence of insomnia (insomnia prescription fill or insomnia ICD-9/10 diagnosis code) in the year prior and in the two-year period after index were included. Inverse probability of treatment weighting and Wilcoxon rank-sum tests were used to compare healthcare resource utilization (HCRU) over 2 years across varying levels of PAP adherence.
Results: From a sample of 26,965 COMISA patients, 28% met the criteria for consistently-adherent, 44% were intermediately-adherent, and 28% were non-adherent to PAP therapy over 2 years after index. The majority of intermediately-adherent

patients had consistent PAP use in the first year of therapy, with decreased use in the second year. Consistently-adherent patients had fewer emergency room (ER) visits per patient than intermediately-adherent patients or non-adherent patients (year 1: 0.49 vs 0.59 [P< 0.001], vs 0.68 [P< 0.001]; year 2: 0.46 vs 0.54 [P< 0.001], vs. 0.60 [P< 0.001]). Consistently-adherent patients also had fewer all-cause hospitalizations per patient than intermediately- and non-adherent patients in both follow-up years (year 1: 0.10 vs 0.15 [P< 0.001], vs. 0.14 [P< 0.001]; year 2: 0.09 vs 0.12 [P< 0.001], vs. 0.13 [P< 0.001]). Based on major diagnostic category (MDC) codes, consistently-adherent patients saw the largest reductions in hospitalizations related to the respiratory, circulatory, nervous, and hepatobiliary systems, as well as those for alcohol/drug use or induced mental disorders.
Conclusion: This study showed reductions in all-cause hospitalizations and ER visits for COMISA patients who were consistently-adherent to PAP therapy over 2 years compared to those with lower adherence. PAP therapy is one facet of COMISA treatment that, if adhered to, can improve health outcomes.
Support (if any): ResMed

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0539
PREDICTORS OF DRIVING RISK IN CPAP-TREATED OSAS: A FRENCH MULTICENTER PROSPECTIVE COHORT

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Introduction: Continuous Positive Airway Pressure (CPAP) therapy is effective in reducing Excessive Daytime Sleepiness (EDS) and driving risk in the vast majority of Obstructive Sleep Apnea Syndrome (OSAS) patients. There is a need to identify predictors of residual driving risk in CPAP-treated patients. We aimed to investigate the determinants of persistent driving risk related to sleepiness in CPAP-treated OSAS patients.
Methods: Longitudinal analysis of a prospective national database including 5,308 patients with OSAS and an indication of CPAP treatment. Near-misses, accidents, and sleepiness at the wheel were assessed before initiation and after ≥ 90 days of CPAP treatment. Multivariate associations with the cumulative incidence of near-misses and accidents on CPAP were calculated using Cox models adjusted for age, sex, obesity, sleep duration, sleepiness at the wheel, accidents/near-misses history, depressive symptoms, residual apnea-hypopnea index, and adherence to treatment.
Results: Residual sleepiness at the wheel on CPAP was associated with eight-fold higher incidence of near-misses (HR=8.63 [6.08-12.2]) and five-fold higher incidence of accidents related to sleepiness (HR=5.24 [2.81-9.78]). Adherence ≤4h/night was also a significant contributor of persistent driving risk (HR=1.74 [1.12-2.71] for near-misses and HR=3.20 [1.37-7.49] for accidents).
Conclusion: Residual sleepiness at the wheel and CPAP-adherence ≤4h/night are easy-to assess markers to detect persistent driving risk during the follow-up evaluations of patients on CPAP. Health professionals, but also policy makers, should be aware of the crucial importance to systematically evaluate these elements during the follow-up evaluations of the patients with OSAS treated by CPAP therapy to improve driving risk.
Support (if any):

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0540
COMPARING PERIODIC LIMB MOVEMENTS OF SLEEP BEFORE AND AFTER HYPOGLOSSAL NERVE STIMULATION THERAPY

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Introduction: Patients with obstructive sleep apnea (OSA) exhibit high prevalence of periodic limb movements of sleep (PLMS). While many studies have explored the impact of positive air pressure (PAP) therapy on PLMS, there was no study of the impact of hypoglossal nerve stimulation (HNS) therapy on PLMS. We reported high prevalence of PLMS in patients receiving HNS therapy (separate abstract). We hypothesized the following: 1) OSA patients with PLMS become candidates for HNS therapy at a higher rate given PAP failure associated with PLMS; 2) HNS therapy itself increases PLMS. This study aims to test the above hypotheses by assessing pre- and post-HNS sleep study data and comparing PLMS in temporal fashion.
Methods: Among subjects receiving HNS therapy from December 2020 to August 2023, 38 subjects with periodic limb movement index (PLMI) data before and after HNS therapy were selected for the subgroup analysis. PLMS diagnosis was based on PLMI ≥ 15. We compared PLMI and PLMS diagnosis between before and after HNS therapy using Wilcoxon's signed rank test and McNemar test.
Results: In our study of 38 subjects, the average of PLMI before and after HNS therapy were median 7.1/hr (interquartile range, 0, 34.6) and 17.2/hr (interquartile range, 3.1, 37.5) respectively, resulting in no statistical significance (P=0.064 by Wilcoxon's signed rank test). Prevalence of PLMS before and after HNS therapy were 36.8% and 60.5% respectively showing significant increase with HNS therapy (P=0.039 by McNemar test).
Conclusion: Our study results indicate comparable baseline prevalence of PLMS as shown in other studies among OSA and significant increase in PLMS while using HNS therapy in this paired pre- and post-HNS analysis, suggesting HNS therapy being a possible cause of PLMS in OSA patients. Further work is warranted to re-confirm the above finding and potentially investigate long-term effect of HNS therapy on PLMS, and PLMS on the outcome of HNS therapy.
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0541
IMPACT OF SLEEP APNEA TREATMENT ON CARDIOMETABOLIC PARAMETERS IN A LARGE NATIONAL MULTI-CENTER ALLIANCE REGISTRY

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Introduction: There is paucity of real-world data regarding the association of Sleep Apnea (SA) treatment and cardiometabolic parameters. We examined the association of SA subgroup (CPAP vs. non-CPAP users) and cardiometabolic factors in the Cardiometabolic Center Alliance multi-center registry.
Methods: Out of 1575 patients, baseline characteristics of 683 patients with SA stratified by CPAP use were compared using Student's t-tests/Wilcoxon rank-sum test for continuous variables and chi-square/Fisher's exact tests for categorical variables. Logistic regression model was used to assess the association of CPAP-use and cardiometabolic factors (Hb A1c, systolic blood pressure and diastolic blood pressure (SBP and SDB mmHg)), Triglycerides (TG) and BMI in unadjusted (Model 1) and after adjusting for age, sex, ethnicity, race, BMI (Model 2) and cardiac co-morbidities, medications, and medication adherence (Model 3).
Results: Overall, median (IQR) age was 65 years (58.0-71.0). 683 (43 %) had sleep apnea, and of those 447 (65%) were CPAP-users. Median age of CPAP-users compared to non-users was 66 years (60-71) vs, 63 years (55.5-71), and they were more likely to be male (275 (61.5%) vs. 112 (52.8%)), and white (398 (89%) vs. 163 (76.9%) (all $p < 0.05$). Among CPAP users HbA1c, SBP, and DBP were 7.2% ± 1.5%, 128.2 ± 18.2, 72.9 ± 11.5; in non-CPAP users the corresponding values were 7.6% ± 1.9% (p=0.002), 131.1 ± 19.4 (p = 0.064), 76.0 ± 12.1 (p =0.002) respectively. Logistic regression showed that CPAP-use was associated with lower HbA1c (-0.31% (95% CI -0.59%, -0.04%), p =0.025) in Model 2 but not in Model 3 (-0.19% (95% CI -0.46%,0.08%), p=0.165). CPAP use was associated with lower SBP (-3.99 (95% CI -7.18, -0.8), p =0.014) and DBP (-2.52 (95% CI -4.45, -0.6), p=0.010) even after adjusting for multiple confounders in Model 3. Higher TG were observed (23.02 mg/dL (95% CI 1.03,45.01), p=0.04) in CPAP-users compared to non-CPAP users (Model 2). CPAP-users compared to non-users had higher BMI (1.14 (95% Cl 0.17, 2.65) p=0.026) Model 3.
Conclusion: In this multi-center registry of patients with cardiometabolic disease, sleep apnea was common, and CPAP use was associated with better control of several key risk factors.
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0542

THE ASSOCIATION BETWEEN THE EFFECTIVE APNEA HYPOPNEA INDEX AND BLOOD PRESSURE REDUCTION EFFICACY AFTER TREATMENT

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Introduction: The effect of sleep apnea treatment on reducing cardiovascular disease risk remains inconclusive. This study aims to assess if the effective apnea hypopnea index (eAHI), a measure of residual sleep apnea burden post-treatment, is a factor in determining blood pressure (BP) response to continuous positive airway pressure therapy. The eAHI integrates time on therapy, residual apnea, and % of sleep time untreated.
Methods: A secondary analysis of the Heart Biomarker Evaluation in Apnea Treatment (HeartBEAT) study, a randomized, controlled, parallel group assessment of continuous positive airway pressure (CPAP), oxygen and sleep hygiene. The Delta-AHI (▲AHI) was defined as the difference between baseline AHI and effective AHI at 12 weeks. Logistic and linear regression models estimated the predictors for nocturnal systolic BP change following sleep apnea therapy.
Results: One hundred and sixty-nine subjects with a mean age of 62.82 ± 6.99 years were included in the final analysis. Fifty subjects had ▲AHI ≤ 8 / hour of sleep and 119 subjects were higher. After adjustment, baseline mean nighttime systolic blood pressure (OR 1.036, 95% CI 1.015-1.058, p: 0.001) and ▲AHI ≥ 8 / hour (OR 2.406, 95% CI 1.116-5.185, p:0.025) were independent predictors for mean nighttime systolic blood pressure change > 3 mm Hg. The effective AHI was negatively related with BNP (β: -2.564, SE: 0.167, p: 0.029) and positively related with troponin change (β: 0.703, SE: 0.256, p: 0.007).
Conclusion: The ▲AHI was an independent predictor of the blood pressure response to sleep apnea treatment.
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0543

THE UTILITY OF THE PAP NAP FOR INCREASING PATIENT UTILIZATION OF POSITIVE AIRWAY PRESSURE THERAPY

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Introduction: While highly effective, compliance of positive airway pressure (PAP) therapy remains a barrier to treating obstructive sleep apnea (OSA) in many patients. PAP NAP is a brief, reimbursable sleep study, designed to help patients with insomnia and OSA acclimate to PAP therapy. Studies have shown increased utilization after the study.
Methods: This is a retrospective study at a single institution of patients who underwent a PAP NAP procedure at our sleep laboratory between 2019 and 2022. The electronic medical record and PAP provider interfaces were queried for demographics, medical and sleep history, sleep study data, and PAP usage. Initial follow-up and most recent available follow-up data was collected. Paired t-test was used to compare utilization before and after intervention.
Results: Twenty-four patients underwent PAP NAP. Average apnea hypopnea index was 34.1 (median 26.3, range 5.3 - 111.6). The average length of PAP NAP was 2 hours 10 minutes (range 50 min - 3 hours 55 minutes). The median initial follow-up time after PAP NAP was 33 days. The median long-term follow-up was 1.2 years. Prior to PAP NAP, 5 patients (20.8%) were compliant with PAP therapy as per Medicare criteria. After PAP NAP, 6 (25%) and 7 (29%) patients were considered compliant at initial and long-term follow-up, respectively. There were statistically significant increases in the percentage of nights with PAP usage at least 4 hours, with mean pre-PAP NAP nights over 4 hours averaging 27% and post-PAP NAP averaging 37% (p=0.02). There was no difference at long term follow-up nor were there significant differences in the percentage of total days used at initial or long-term follow-up.
Conclusion: While an initial increase in the percentage of nights PAP was used at least 4 hours, this does not represent a clinically meaningful difference as few patients increased usage enough to meet the standards of adequate PAP use, and there was no difference at long term follow up. There may be a role for PAP NAP in patients who are already compliant but have problems with tolerance, mask fit, or high residual disease. This area should be further explored as it was a small portion study.
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0544

THE IMPACT OF TELEMEDICINE ON CONTINUOUS POSITIVE AIRWAY PRESSURE ADHERENCE IN OBSTRUCTIVE SLEEP APNEA PATIENTS

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Introduction: Telemedicine has grown in popularity among patients for initial sleep medicine consultation following the COVID-19 pandemic. We sought to evaluate whether initial telemedicine consultation adversely impacted CPAP adherence over the initial 90 days of use among patients diagnosed with obstructive sleep apnea (OSA).

Methods: We reviewed the medical records of all patients initiated on CPAP therapy between January and May of 2023 at three academic sleep clinics at the University of Pittsburgh Medical Center. We compared CPAP adherence at 90 days between patients whose initial evaluation was done via telemedicine versus an in-person visit. Logistic regression was used to compare the odds of achieving Centers for Medicare & Medicaid Services (CMS) adherence criteria for long-term coverage accounting for age, sex, and race.

Results: A total of 289 patients were initiated on CPAP during the period studied with 141 (48.8%) having a telemedicine consult and 148 (51.2%) having an in-person visit. The cohort had a mean age 52 +/- 15 yrs, 38% were women, 76% were White and 18% were Black with no significant differences between the two groups. There was no difference in the percentage of patients achieving CMS criteria for long-term coverage (72.4% with telemedicine vs. 69.3% with in-person, p=0.95). Similarly, mean nightly usage over 90 days (261 ± 12 min with telemedicine vs. 243 ± 13 min with in-person, p=0.31) and percent of nights with more than 4 hours of CPAP use (60.0 ± 2.8% with telemedicine vs. 55.4 ± 2.9% with in-person, p=0.26) did not differ between groups. Results were similar when stratified by sex and did not change when adjusted for age, sex, and race.

Conclusion: Clinical outcomes in the treatment of OSA are not inferior in patients evaluated via telemedicine. Given the convenience of telemedicine for many patients, particularly those living in rural areas and those with limited ability to take time off from work or access transportation, greater use of telemedicine can expand access to OSA care without reducing the quality of care.

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0545

HYPOGLOSSAL NERVE STIMULATION: DOES HIGHER PRE-IMPLANTATION PAP PRESSURE RESULT IN LESS SUCCESSFUL OUTCOMES?

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Introduction: Despite hypoglossal nerve stimulation (HNS) being an approved therapy for moderate to severe OSA, some patient's do not have a favorable outcome despite meeting the inclusion criteria for the procedure. This study investigates whether higher pre-implantation optimal PAP pressure results in less successful HNS outcomes.

Methods: This is a single-center retrospective study of consecutive patients with moderate to severe OSA who underwent implantation of HNS at an academic medical center. The optimal pre-implantation pressure setting was derived from either PAP titration studies (optimal CPAP or EPAP pressure) or PAP therapy compliance reports (90th or 95th percentile CPAP pressure or 95th percentile EPAP pressure). Pre-implantation AHI was obtained from either a home sleep study or diagnostic sleep study. Post-implantation apnea/hypopnea index (AHI) was derived from polysomnography performed 3 months or later after device activation in all subjects. Success of HNS therapy was defined as either a reduction of the pre-implantation AHI by equal to or greater than 50% or a residual AHI < 15. A Mann-Whitney nonparametric test was used to compare the distribution of pre-implantation PAP pressure between successful and unsuccessful HNS therapy.

Results: Fifty-one patients with HNS implanted between December 2021 and July 2023 were evaluated. 74.7% were male with a median age of 65 years (25th percentile 57 and 75th percentile 72) and median body mass index (BMI) of 29.4 (25th percentile 27.2 and 75th percentile 31.6). Median BMI of the HNS success group was 29.4 (n = 45, 25th percentile 27.4 and 75th percentile 31.6) and median BMI of the HNS not success group was 30.0 (n = 6, 25th percentile 26.8 and 75th percentile 33.2). Median pre-implantation optimal PAP pressure of the HNS success group was 11.2 cm H2O (25th percentile 8.7 and 75th percentile 14.25). Median pre- implantation optimal PAP pressure of HNS not success group was 9.2 cm H2O (25th percentile 5.6 and 75th percentile 15.5). There was no significant difference between optimal pre- implantation PAP pressure and HNS outcome (p = 0.3).

Conclusion: There was no statistically significant difference between optimal pre-implantation PAP pressure and HNS outcome.

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0546

AROXYBUTYNIN AND ATOMOXETINE FOR THE TREATMENT OF OSA: RATIONALE AND DESIGN OF THE SYNAIRGY PHASE 3 RCT

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Introduction: There are no FDA-approved drugs available for the treatment of obstructive sleep apnea (OSA). The relaxation of upper airway muscles at sleep onset and insufficient muscle reactivation during obstructive events are the key pathophysiological determinants of OSA. Pharmacotherapy targeting the activation of upper airway muscles is a promising strategy for the alleviation of OSA.

Methods: AD109 is a combination of the antimuscarinic aroxybutynin 2.5 mg, the R-enantiomer of oxybutynin, and the norepinephrine reuptake inhibitor atomoxetine 75 mg. In the phase

2b Mariposa trial, AD109 demonstrated a clinically significant reduction of -47.1% (95% CI: -61.2 to -27.9) in the apnea-hypopnea index (AHI) compared to a placebo, along with an important decrease in subjective fatigue, measured using the Patient Reported Outcome Measurement Information System (PROMIS) scale, at one month of treatment. The ongoing SYNAIRGY study, a placebo-controlled 26-week phase 3 clinical trial, is designed to investigate both the efficacy and safety of AD109 2.5/75 for the treatment of mild to severe OSA. Eligible participants include adults with AHI4 (4% desaturation definition for hypopneas) ≥5, and a BMI < 42kg/m2 for women and < 40 kg/m2 for men who either decline or are unable to tolerate continuous positive airway pressure treatment. Approximately 640 participants will be randomized in a 1:1 ratio to receive either placebo or AD109. We hypothesize that AD109 treatment will provide a clinically meaningful AHI decrease compared to placebo-treated participants with OSA.

Results: The primary endpoint is the response rate in the AD109 arm vs. placebo arm, where response is defined as >50% reduction in AHI4 from baseline to 26-week polysomnogram (PSG). Participants will have a PSG on treatment at week 4. Secondary endpoints include changes from baseline in PROMIS-Fatigue, PROMIS-Sleep Impairment, hypoxic burden, Patient Global Impression of Severity (PGI-S) for fatigue, and the Epworth Sleepiness Scale. Safety assessments will include multiple in-office measurements of heart rate and blood pressure throughout the treatment period.

Conclusion: The SynAIRgy phase 3 randomized, controlled clinical trial aims to assess the efficacy and safety of AD109 in in the treatment of OSA by targeting key pathophysiologic mechanisms of upper airway muscle relaxation during sleep.

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0547

VIL-TRA

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Introduction: Obstructive sleep apnea (OSA) poses deleterious health consequences. Pharmacotherapy is a promising alternative to the current standard of care; recently, a combination of the noradrenergic atomoxetine, with the antimuscarinic aroxybutynin reduced OSA severity. Atomoxetine has also proven to be efficacious in combination with the anti-depressant trazodone. However, atomoxetine is wake-promoting especially in the subgroup of poor CYP2D6 metabolizers, which may contribute to apnea cycling and reduced drug tolerability. Therefore, we investigated the effect of a potentially more manageable noradrenergic, viloxazine, with and without trazodone, on OSA severity.

Methods: Twenty-five patients with OSA (apnea-hypopnea index [AHI4] 10-45) aged 18-75 years were randomized to viloxazine 500mg, viloxazine/trazodone 500/75mg or placebo according to a double-blind, placebo-controlled, crossover study. Drugs were taken before bed, for two weeks each period, with a first week of run-in (viloxazine 200mg and/or trazodone 50mg) and a 1-week washout between periods. In-laboratory polysomnography was performed at the end of each crossover period. Mixed model analyses compared the effect of the combination vs. placebo on AHI4 (primary outcome), hypoxic burden, total sleep time (TST) and wake-after-sleep-onset (WASO; secondary outcomes). Tertiary analyses explored differences between the parameters above across all treatment arms, in addition to sleep architecture and subjective outcomes. Safety endpoints were also assessed.

Results: Viloxazine-trazodone reduced AHI4 (13 [6, 19] events/h] vs. placebo (53 %min/h, 28 events/h) and hypoxic burden (mean reduction (95% CI): 26 [14, 34] %min/h). The combination reduced TST [37 [13, 61] min) and increased WASO (26 [2, 49] min) vs. placebo. Viloxazine alone had a similar effect on OSA severity vs. placebo. However, its impact on sleep quality (TST -61 [-85, -37] min; WASO 41 [18, 64]) was accentuated vs. placebo. Both viloxazine and the combination worsened patient-reported outcomes vs. placebo; these changes seemed more pronounced on viloxazine alone vs. placebo. 6 patients terminated the study early, 5 due to adverse events. Commonly reported adverse events were insomnia, constipation, headache, and xerostomia. Both treatments slightly increased heart rate.

Conclusion: Viloxazine-trazodone combination may reduce OSA severity. Potential deleterious effects of viloxazine on sleep quality appear partly attenuated by concurrent trazodone.

Support (if any): This study was funded by Apnimed.

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0548

A 5-YEAR MULTI-CENTER REAL-WORLD STUDY EVALUATING THE EFFECTIVENESS AND USE OF CAD/CAM 3D-PRINTED OAT TO TREAT OSA

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Introduction: Oral appliance therapy (OAT) treats a wide range of obstructive sleep apnea (OSA). This prospective, collaborative (physician/dentist) study will assess the primary endpoint of at least a 50% reduction in baseline apnea-hypopnea index (AHI) at five years with initial objective efficacy evaluation at three to six months. The Panthera D-SAD is a CAD/CAM, 3D-printed OAT. Patient- matched for fit and comfort. Changeable rods provide the mechanism for protrusion. This study fulfills French reimbursement requirements.

Methods: OAT naïve individuals with an AHI 15-30 or those with an AHI ≥ 30 who decline CPAP will be considered, meeting all other entry criteria. Fifteen centers in France will enroll an estimated 217 participants. Consecutive sampling will be used. Participants will be medically and dentally evaluated. The initial

fitting will be at Visit 1 (V1). Standard of care for the study duration will be followed. Evaluation time points are three-six months (sleep testing/medical), six months (dental), and five years (both). Secondary endpoints include OAT side effects, oxygenation status, quality of life, self-reported adherence, and subjective symptoms at the aforementioned time points.
Results: Between April, 2022, and December, 2023, 171 subjects have had their sleep and orthosis evaluation for entry into the study (V0). The demographics for those who have completed V0 (n=171): averages (SD) age 49.7 (13.0); BMI 26.75 (4.81); baseline AHI of 22.2 (8.7), ODI 17.16 (11.92), SpO2 91.7 (2.18). This update summarizes data from the subset (n=76) with sleep testing (V2). At baseline, 92% of participants had moderate OSA. Sixty-three percent of all participants achieved at least a 50% AHI reduction. Sixty-two percent achieved an AHI < 10. At V2, 84% severe and 87% moderate transitioned to a lower severity category. For moderate, 21% reached the normal category. Eighty-seven percent reported weekly use at V2 (n=62) for seven nights/week, and 97% indicated they used the device for ≥ 4 hours a night. Only 2.3% of participants stopped wearing the device.
Conclusion: This updated data demonstrates a high OAT acceptance and comfort rate for patients. Preliminary data are tracking well for reducing total AHI and migrating to a less severe AHI category.
Support (if any): Panthera Dental Inc

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0549

NON-PERMANENT ORAL APPLIANCE TREATMENT OF SEVERE OBSTRUCTIVE SLEEP APNEA

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Introduction: The FDA recently cleared the first OSA treatment by oral appliances (mRNA, mmRNA, and DNA, Vivos Therapeutics, Littleton, CO). These appliances are designed to be worn 6-24 months and use slow maxillary expansion (DNA) combined with mandibular advancement (mRNA/mmRNA) to increase upper airway volume and improve OSA.
Methods: This retrospective analysis used a research database initiated in 2018 incorporating real world data from treating dentists for these devices to September 2023. Database contains pre-/posttreatment (without the oral appliance) AHI, transpalatal width (TPW), airway volume (AV) via cone beam computed tomography, and safety data. Study inclusion criteria were adults with severe OSA (AHI>30), mRNA (includes mmRNA)/DNA treatment, and pre-/posttreatment AHI > 6 months apart; exclusion criterion was no safety data. Co-primary endpoints were pre- to posttreatment AHI and TPW improvement; secondary endpoints were pre- to posttreatment AV improvement and safety measures.
Results: Seventy-three severe OSA patients (36 mRNA/37 DNA) were compared to 35 moderate OSA patients (12 mRNA/23 DNA). Severe OSA: 38 men/35 women, Age 56.3±10.8years, Treatment Duration 15.6±7.2months, Appliance Adherence 11.9±2.6hours. Moderate OSA: 15 men/20 women, Age 48.9±11.7years, Treatment Duration 13.0±6.0months, Appliance Adherence 12.4±2.5hours. For severe OSA patients, pre-treatment vs. posttreatment AHI, TPW, and AV were found to significantly decrease 46.1±15.1 to 21.7±14.8 (-50.8%, p<.00001), increase 33.2±3.5 to 35.5±3.7mm (+7.2%, p<.00001), and increase 20479±7991 to 23767±9191mm3 (+16.6%, p<.00001), respectively. For moderate OSA patients, pre-treatment vs. posttreatment AHI, TPW, and AV were found to significantly decrease 21.6±4.5 to 12.0±10.5 (-44.4%, p<.00001), increase 32.9±2.8 to 35.1±2.9mm (+6.6%, p<.00001), and increase 21598±6260 to 24364±6033mm3 (+12.8%, p<.005), respectively. Severe OSA patients who wore mRNA and DNA appliances decreased their AHI by 55.6% and 46.2% and reduced their AHI classification by 1 or improved their AHI by 50% were 81% and 78%, respectively. No significant safety issues were observed.
Conclusion: Historically, oral appliances were indicated for those with mild-moderate OSA; this study showed that severe OSA patients had more improvement in AHI, TPW, and AV vs. those with moderate OSA. Results were slightly better for patients with DNA vs. mRNA, demonstrating that the primary improvement mechanism is maxillary expansion with persistent treatment effects without the appliance in place.
Support (if any):

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0550

EMPIRIC ASV SETTINGS FOR CENTRAL SLEEP APNEA FOLLOWING HSAT DURING SARS COVID-19 PANDEMIC- A RETROSPECTIVE ANALYSIS

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Introduction: Adaptive servo-ventilation (ASV) uses noninvasive ventilator to treat hyper ventilatory central sleep apnea (CSA)by delivering servo-controlled inspiratory pressure support on top of expiratory positive airway pressure. ASV devices appear to be effective for treatment of Central sleep apnea and Combined sleep apnea syndromes that are resistant to CPAP [1]. All the studies to date recommend ASV settings following in lab titration. However, during the SARS Covid-19 pandemic given the significant limitation of in lab studies, empiric ASV were prescribed for CSA following home sleep apnea studies. We retrospectively analyzed the empiric ASV settings and patient adherence in correlation to the BMI.
Methods: Retrospective chart review of 1582 pts (patients de-identified) who underwent HSAT at the NM VA clinic during 2021-2023 was done. Among the 1582 pts who underwent HSAT, 113 pts had predominant Central Sleep Apnea (CAI >10) . 21 pts were placed on empiric ASV. We retrospectively analyzed the adherence to ASV therapy in 2 week and 3 years follow up period.13 of the 21 pts did not meet the 2 week and 3-year compliance. The EPAP data is derived from the 8 pts who continued on the empiric ASV settings and success is based on their 2 week and 3-year adherence.
Results: Median EPAP ranged between 5-7 cwp for pts with BMI less than 30, EPAP of 7-8 cwp with BMI between 30-40 and an EPAP 10 for BMI>40. 8 pts had good compliance (>70% use of >4 hours every night) in 2 week download with median Apnea Index 0.1(SD 2.6), median pressure support used 4.6(SD1.1). Patients with cardiac concern had echocardiogram documented LVEF >45% prior to starting empiric ASV. Serum Bicarbonate ranged between 17-26.
Conclusion: Though not the most efficient way compared to in lab titration study, empiric ASV settings based on the BMI may be utilized in resource limited settings or inability to perform

in lab studies due to patient limiting factors. Providers should also be cognizant about hypo ventilatory concerns and respiratory depression given ASV therapy utilizes minute ventilation. Caution must be exercised in patients with heart failure due to the potential increased mortality on ASV.
Support (if any):

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0551
TELEMEDICINE MOTIVATIONAL ENHANCEMENT IN HEART FAILURE AND SLEEP APNEA RANDOMIZED CLINICAL TRIAL

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Introduction: Despite evidence suggesting that Positive Airway Pressure (PAP) in patients with Acute Decompensated Heart Failure (ADHF) with Obstructive Sleep Apnea (OSA) confers improvement of cardiovascular outcomes, PAP adherence remains exceedingly low. We hypothesized that motivational enhancement (ME) via a telemedicine intensive approach improves PAP adherence post-discharge in hospitalized patients with ADHF and OSA
Methods: Telemedicine Intensive Motivational Enhancement (TIME) (NCT04752462) is an ongoing randomized clinical trial designed to investigate telemedicine ME effect on post-discharge PAP adherence, rehospitalizations, and patient-reported outcomes compared to standard of care at 3 and 6 months in patients admitted with ADHF and in-hospital OSA diagnosis (respiratory event index, REI>5). We describe baseline characteristics of 56 patients currently enrolled. Unadjusted and adjusted linear models were used to describe associations of OSA measures (Respiratory Event Index, REI and percentage of recording time< 90%SaO2,T90) with Kansas City Cardiomyopathy Score(KCCQ). Adjusted models included age, sex, race, and body mass index(BMI).
Results: Since April 2021, 5,742 patients were screened and of these, 3,822 had an admission diagnosis of ADHF, of which 343 underwent in-hospital portable sleep testing. Of these, patients were excluded for the following reasons: central predominant apneas (CA >50% of total REI) 31.5%(n=108), sleep-related hypoxemia 18.7%(n=64), negative for OSA 20.1%(n=69), declined PAP therapy 10.5%(n=36) or declined to participate in the clinical trial 2.9(n=10). Characteristics of the 56 participants currently enrolled are:age:60±14 years, 38% women, 45%black race, BMI of 35±8, left ventricular ejection fraction:40±16%, REI:26±14 and T90:19±17% and Epworth Sleepiness Scale:6[IQR, 3-10]. Comorbidities were hypertension 77%, atrial fibrillation 34%, valvular disease 21%, myocardial infarction 20%, and diabetes 39%. Self-reported health status at baseline was poor with a KCCQ score of 38±26. In adjusted analyses, for each unit increase of REI and T90, the overall KCCQ scores were associated with non-significant reduction by -0.29 (95% CI:-0.89,0.31, p=0.34) and -0.19(95%CI: -0.73,0.35,p=0.49) points respectively.
Conclusion: The TIME trial is designed to elucidate the effect of ME through telemedicine on PAP adherence and patient outcomes post-discharge in patients with ADHF and OSA. Directionally increased OSA severity was related to lower KCCQ scores, as expected, in OSA and ADHF, however, these relationships were not significant.
Support (if any): AASM Foundation

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0552
ANALYSIS OF AUTONOMIC ACTIVITY AFTER CONTINUOUS POSITIVE AIRWAY PRESSURE THERAPY USING HEART RATE SPECTRAL ANALYSIS

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Introduction: Obstructive sleep apnea (OSA) is estimated to affect 29.5 million people living in the United States. OSA patients experience repeated airway occlusions leading to numerous episodes of apnea nightly, increasing their risk for heart disease, stroke, and diabetes. Patients benefit from CPAP because it restores processes that promote recuperation of the autonomic nervous system (ANS). Several studies have investigated the health consequences using different measurements of ANS activity like heart rate variability (HRV). HRV can be analyzed using frequency domains such as the low-frequency (LF) to high-frequency (HF) ratio, or with time domains like the exhalation to inhalation (E:I) ratio. HF and exhalation are associated with parasympathetic activity, while LF and inhalation are associated with sympathetic activity. Here, we aimed to better understand the relationship between ANS activity in OSA CPAP-compliant versus CPAP non-compliant patients using HRV analysis. We hypothesized that compliant patients will have lower LF/HF ratios and greater E:I ratios compared to noncompliant patients during various ANS test maneuvers.
Methods: OSA patients were divided into CPAP-compliant (n= 20) and non-compliant groups (n= 18). Patients had to have been CPAP compliant for at least 8 weeks. HRV was determined using a wireless ECG device and IntelleWave HRV Analyzer software. Data was collected while patients were supine, sitting upright, performing a Valsalva maneuver with handgrip, and deep breathing.
Results: Significant differences in the LF/HF ratio were found between groups when patients were supine ($p < 0.001$), standing ($p < 0.001$), and during normal breathing ($p < 0.006$). No significant difference was found between groups when performing the Valsalva maneuver. A significant difference in E:I ratios was observed only during deep breathing, 1.36±.15 in CPAP non-compliant patients versus 1.59±.24 in CPAP compliant patients; $t(36) = -3.578$, $p < .001$.
Conclusion: A greater restoration of sympathovagal activity was observed during activities with a parasympathetic predominance (lying down, standing, and normal breathing) compared to maneuvers requiring significant physiological effort (Valsalva maneuver) following CPAP therapy. This suggests a greater duration of CPAP therapy may be required to restore autonomic balance during strenuous activities.
Support (if any):

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0553
CHANGES IN QTC AND QT VARIABILITY IN PATIENTS WITH OSA WITH AND WITHOUT HEART FAILURE WITH PAP BASED ON SLEEP STAGE

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Introduction: Obstructive sleep apnea (OSA) is characterized by episodes of partial or complete collapse of the upper airway. OSA has been associated with increases in QTc interval and QT variability—risk factors for ventricular arrhythmias and death. This study explores how QTc and QT Variability change with positive airway pressure therapy (PAP) in patients without heart failure (HF), HF with preserved ejection fraction (HFpEF), and HF with reduced ejection fraction (HFrEF) based on sleep stage.
Methods: Consecutive patients with OSA undergoing diagnostic and PAP titration polysomnography (PSG) were included for analysis. Electrocardiogram (ECG) analysis during PSG was performed using Comprehensive Analysis of Repolarization Signal (COMPAS) software for the longest apnea/hypopnea events in NREM and REM for the diagnostic period as well as on the highest CPAP or BPAP pressure delivered for the titration PSG. Both Bazett's (QTbc=QT/RR1/2) and Fridericia's (QTfc=QT/RR1/3) corrections were used to calculate corrected QT. QT variability measures included the standard deviation of QT intervals (SDQT), normalized QT interval variance (QTVN), short-term interval beat-to-beat QT variability (STVQT) and QT Variability Index (QTVi). Sleep stages were characterized as Non-Rapid eye movement (NREM) vs. REM.
Results: Ninety two patient diagnostic and 92 titration PSG were reviewed (54% male, age 54 ± 15 years, BMI 38.5 ± 8.9, AHI 51.8/hr ± 39.0, minimum spO2 74.9% ± 14.4). Only eight percent of the patients had HF. There were no significant differences in QTfc and QTbc in NREM and REM. In the no HF cohort, QTVi decreased significantly in REM (n=31) during titration (0.78 ±1.79) when compared to baseline (1.64 ± 1.65), p=0.0026. In the no HF cohort, no significant changes were noted in QT variability during NREM (n=66) in the titration PSG when compared to the diagnostic PSG. No other findings in QT variability were statistically significant including the HFrEF and HfpEF cohorts however those sample sizes were very small.
Conclusion: PAP in patients with no HF may result in decreased QT variability and the effects may be varied based on sleep stage. Our findings need to be verified in larger cohorts.
Support (if any): American Academy of Sleep Medicine Foundation, National Institutes of Health , The University of Arizona

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0554

CARDIAC IMPACT OF HYPOGLOSSAL NERVE STIMULATION FOR OBSTRUCTIVE SLEEP APNEA

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Introduction: Sleep disordered breathing is a common contributor to cardiovascular morbidities. Inspire™ hypoglossal nerve stimulation is an effective way to treat moderate to severe obstructive sleep apnea (OSA). Although the cardiovascular effect of this relatively new treatment is not established, resolution of OSA is associated with reduced cardiac afterload and sympathetic tone and should be of benefit to the heart. Accordingly, we report on a small case series (n=6) of OSA patients treated with this device, with available echocardiograms before and after device therapy.
Methods: In a single center retrospective analysis, we compared echocardiograms from mean of 479 days before and mean of 464 days after device implantation.
Results: Mean apnea hypopnea index decreased from baseline of 41 events/hour to 9.7 events/hour. Echocardiographic data suggest that with treatment, cardiac chambers decrease in size (left ventricle 5.5 to 5.1 cm, right ventricle 4.3 to 4.0 cm, left atrial volume index 42 to 33 ml / m2). Left ventricular ejection fraction increases (43 to 51 %). Central venous pressure decreases (4.4 to 3 mmHg) and mitral and tricuspid valve regurgitation appear to be somewhat less.
Conclusion: In this first report of hypoglossal nerve stimulation therapy for OSA, treatment appears to have a salutary impact on cardiac structure and function. While the small number of patients makes it impossible to draw definitive conclusions, the consistent direction of trends for all the relevant parameters is notable. Larger, prospective studies are warranted to confirm these preliminary observations.
Support (if any):

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0555

TREATMENT RESPONSES IN US MILITARY PERSONNEL WITH COMORBID INSOMNIA AND OBSTRUCTIVE SLEEP APNEA

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Introduction: Comorbid insomnia and obstructive sleep apnea (COMISA) is the most prevalent sleep disorder in military sleep clinics. While there is no established COMISA treatment regimen, patients frequently receive cognitive behavioral therapy for insomnia (CBTI) and positive airway pressure (PAP) therapy. The aims of this study were to examine treatment responses in military personnel with COMISA and determine if there were differential responses to therapy in male and females.
Methods: In an observational study, 130 participants (38.5% females) were diagnosed with COMSIA and received CBTI and PAP therapy in a routine clinical setting. Treatment responses were assessed by changes from baseline to 12 weeks with the Insomnia Severity Index (ISI), Epworth Sleepiness Scale (ESS), and Pittsburgh Sleep Quality Index (PSQI). Descriptive statistics, parametric and non-parametric pairwise comparisons were used to assess differences between sexes at baseline. Linear mixed effects models for longitudinal data were used to examine differences between sexes in treatment responses overtime.
Results: There were significant decreases from baseline to 12 weeks in the ISI among males (-5.45 (95% CI, −6.94 to −3.96), p <.0001), and females (-6.25 (95% CI, -8.18 to -4.31), p <.0001), ESS among males (-2.52 (95% CI, -3.67 to -1.36), p <.0001) and females (-2.21 (95% CI, -3.71 to -0.72), p = .0017), and PSQI among males (-3.94 (95% CI, -4.96 to -2.91), p <.0001) and females (-3.64 (95% CI, -4.98 to -2.31), p <.0001). PAP Adherence was 8.5% in women and 23.1% in men (p = .053). Treatment responses were not significantly differences between genders.

Conclusion: Although the majority of military personnel with COMISA were non-adherent to PAP, there were significant responses on the ISI, ESS, and the PSQI. This suggests the insomnia may have greater clinical significance than OSA. CBTI could be considered first line COMISA therapy in a military population that primarily has mild sleep disordered breathing.
Support (if any): This work was supported by the Defense Health Agency, Defense Medical Research and Development Program, Clinical Research Intramural Initiative for Military Women's Health (DM170708; Mysliwiec) and the US Air Force (USAF) Air Force Materiel Command (AFMC), Wright Patterson Air Force Base, Ohio (FA8650-18-2-6953; Peterson).

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0556

COMORBID INSOMNIA & SLEEP APNEA IS LINKED TO WORSE SLEEP & FUNCTION VS OSA ALONE IN OLDER VETERANS WITH NO PAP USE

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Introduction: Many patients with obstructive sleep apnea (OSA) discontinue positive airway pressure (PAP) over time. Insomnia symptoms frequently co-occur with OSA and are common in older adults. Comorbid insomnia and sleep apnea (COMISA) is associated with greater sleep disturbance, impaired daytime functioning, and worse quality of life vs OSA (or insomnia) alone. Whether COMISA vs OSA alone is associated with greater impairment in sleep quality and sleep-related function among older patients and no /limited PAP use is unknown.
Methods: Veterans with moderate or severe OSA (apnea-hypopnea index [AHI] >15) and no/limited objective current PAP use (prescribed >1 year ago) completed Insomnia Severity Index (ISI), Pittsburgh Sleep Quality Index (PSQI), Epworth Sleepiness Scale (ESS), and Functional Outcomes of Sleep (FOSQ-10) questionnaires. T-tests and age-adjusted regression analyses were used to compare participants who met DSM-5 diagnostic criteria for chronic insomnia disorder and sleep apnea (COMISA) vs OSA alone.
Results: In 128 veterans (Mage=64.6 years, 89% male, 19.5% Hispanic, 35.9% Black, 9.4% American Indian/Alaska Native, mean comorbidity index=5.5, BMI=32.2) with no/limited PAP use, COMISA (n=77, mean ISI=13.3) was associated with worse PSQI [7.8 vs 10.9], ESS [7.6 vs 9.6] and sleep-related function (FOSQ-10 15.6 vs 14.1) vs OSA alone (n=51, mean ISI=8.9) (all P<.05) despite no differences in AHI.
Conclusion: Among veterans with moderate-to-severe OSA and no/limited current PAP use, those with comorbid insomnia disorder (COMISA) have worse sleep quality, more daytime sleepiness and worse sleep-related function. These findings suggest that efforts to address insomnia disorder in addition to PAP use may be particularly important among older veterans with COMISA who do not use their prescribed PAP.
Support (if any): VA, NIH/NHBLI

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0557

THE IMPACT OF GENDER ON THE OBSTRUCTIVE SLEEP APNEA—DEPRESSION RELATIONSHIP

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Introduction: Obstructive sleep apnea (OSA) and depression commonly co-exist and have complex relationships. Depressive symptoms may be a particularly common manifestation of OSA among women, with women going undiagnosed with OSA for many years. Conversely, effective OSA treatment may improve depression control. We sought to evaluate the relationship between OSA and depression including the impact of treatment, and how this varies by gender.
Methods: We linked administrative claims data with objective positive airway pressure (PAP) therapy device usage data to identify a cohort of adult patients diagnosed with OSA, newly initiated on a PAP device, with medical and pharmaceutical claims data available from 1 year prior to 2 years post PAP initiation date (index). Depression was defined by at least 2 healthcare encounters with a depression diagnosis code in the year prior to index, with no depression pre-index defined by no depression diagnosis codes. PAP adherence was categorized as consistently adherent, intermediately adherent, or non-adherent based on objective usage over 2 years.
Results: A total of 345,707 patients with OSA initiating PAP were included in this analysis, of whom 57,397 (16.6%) had depression, including 25.5% of women and 10.6% of men (p< 0.001). In both women and men, individuals with depression had a greater burden of most comorbidities, including severe obesity, hypertension, type 2 diabetes, coronary artery disease, cerebrovascular disease, and heart failure. Over 2 years, PAP adherence was lower among patients with depression. Women with depression had the lowest proportion of adherent patients (23.3% vs 28.8% men with depression, 31.3% women without depression, 37.8% men without depression, p< 0.001). Hours per day and days per week of PAP use followed this same pattern. Lower PAP adherence was associated with lower rates of antidepressant medication use at 1- and 2-years post-PAP initiation in both women and men.
Conclusion: We found in a real-world cohort that depression commonly co-exists with OSA, particularly in women. PAP adherence is lower in those with depression, especially among women. This study highlights the need to further understand the impact of depression in women with OSA.
Support (if any): ResMed

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0558

COULD TREATMENT OF SLEEP APNEA WORSEN SOMNOLENCE?

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Introduction: Patients presenting with daytime somnolence need to be evaluated for common etiologies including sleep-related breathing disorders, shift work disorder, insufficient sleep, insomnia and disorders of hypersomnolence. Sleep disordered breathing (SDB) is one of the most common causes of daytime sleepiness. We postulate that treatment of SDB may actually worsen symptoms, if associated with poor sleep due to positive airway pressure (PAP) therapy.
Methods: N/A
Results: A 49-year-old female presented to our clinic with increased daytime somnolence. She was diagnosed with obstructive sleep apnea (OSA) at an outside center 3 years ago and was started on auto PAP therapy with pressure settings at 6-10 cmH2O. She had 100% usage, 95th percentile pressure of 9 cm H2O, and a residual Apnea Hypopnea Index (AHI) of 1.1. The patient reported excessive daytime sleepiness, with an Epworth Sleepiness Scale of 16, requiring a daily 3-hour nap. Further sleep history revealed that she had multiple nocturnal awakenings due to discomfort with PAP therapy, including mask related issues causing sleep disruption. Several mask adjustments did not result in any sleep improvement. We decided to re-evaluate her with an in-lab polysomnography. Diagnostic data revealed an overall AHI of 1.6, supine AHI of 12.0, and lateral AHI of 1.5. Mean oxygen saturation was 94.6% with a nadir of 89.0%. The patient was advised to discontinue PAP therapy, and to sleep on her sides, which led to improvement in her sleep quality and daytime sleepiness.
Conclusion: Positional OSA, defined by greater than 50% increase in AHI in supine position compared to non-supine position, with or without AHI less than 5 in non-supine position, is seen in up to 50-60% of patients with OSA. In addition, intolerance to CPAP has been noted in 29-83% of patients. We need to be clinically aware of the potential effect of PAP devices, or oral appliances, on sleep disruption among intolerant patients. Among this group, conservative therapies like positional therapy or weight loss may be more effective for symptom management, especially for mild SDB.
Support (if any):

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0559

PREDICTIVE PARAMETERS OF VETERANS WITH FALSE NEGATIVE HOME SLEEP APNEA TEST IN DIAGNOSIS OF OBSTRUCTIVE SLEEP APNEA

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Introduction: Obstructive sleep apnea (OSA) is prevalent among United States Veterans. The STOP-BANG questionnaire and Home Sleep Apnea Testing (HSAT) provide a cost-effective alternative to polysomnography (PSG). However, HSAT's diagnostic accuracy is not always precise. Our hypothesis posits a higher false negative (FN) rate in veterans with specific demographics or comorbidities, even with a STOP-BANG score of 3 or more. Our study explores variations in HSAT diagnostic accuracy across demographics and predictive parameters for FN HSAT in identifying OSA patients.
Methods: This retrospective chart review includes Veterans referred to SLVHCS Sleep Center for OSA evaluation (01/01/2023 to 12/01/2023) with a STOP-BANG score of 3 or more. HSAT with WatchPAT® was performed, followed by confirmatory PSG post-negative WatchPAT® analysis. FN rates and predictive parameters were compared between FN and true negative (TN) using paired t-testing and chi-square testing.
Results: A total of 107 negative HSAT patients (68.22% male, 31.78% female) with an average age of 43.36 ± 11.9 were included in the study. Among patients with negative HSATs, males had a higher FN rate than females (73% vs. 44%, p=0.0028). Further analyses showed no significant differences in age, BMI, PSG sleep time, STOP-BANG score, or psychiatric comorbidity between false and true negatives. Interestingly, a trend was noticed in African Americans, who had more FN tests than Caucasians (69.8% vs. 59.2%, p=0.090).
Conclusion: Our findings suggest a higher likelihood of FN results in negative HSATs among male compared to female Veterans. Additionally, there may be an association of higher FN tests in the African American race. Further analyses with a larger sample size and inclusion of true positive tests are needed for a conclusive assessment of HSAT's diagnostic capability in the specified categories.
Support (if any):

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0560

CPAP EFFECT ON ENERGY EXPENDITURE, INTAKE, BODY COMPOSITION, AND SLEEP PATTERNS: A RANDOMIZED CONTROLLED TRIAL

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Introduction: The mechanism of weight gain after continuous positive airway pressure (CPAP) treatment for treating obstructive sleep apnea (OSA) has not been fully elucidated. We hypothesized that CPAP treatment could result in positive energy expenditure through lowering basal metabolic rate (BMR) and increasing nutrition intake which the later associated with delayed bedtime and shorter sleep duration. That led to increase in body weight and fat mass.
Methods: The consecutive patients with untreated moderate-severe OSA assessed with 7-day Actiwatch, 3-day intake dietary, repeated polysomnography, BMR, body composition, and blood check. Participants were randomized to CPAP or usual care and reassessed 12 weeks later. The primary outcome was resting energy expenditure (REE) and respiratory quotien (RQ) while second outcomes were nutrition intake, eating behavior, and fat/fat free mass. Third outcomes were objectively measured mid-sleep time and sleep hour. The APAP effect was assessed with between-group differences in outcome changes.

Results: From 66 patients recruited, 26 patients each were randomized to CPAP and usual care, which 21 patients and 24 patients completed the study, respectively. Compared to usual care, CPAP treatment was not associated with changes in REE and RQ, total caloric intake, fat mass, mid-sleep time and sleep hour, while it was associated with increase in body mass index (mean difference 0.6 kg/m2, 95% confidence interval, 0.07 to 1.19), fat free mass, and fat intake, and less Cognitive Restraint eating.
Conclusion: The short-term CPAP treatment had no effect on energy expenditure and sleep pattern though it increased weight, fat free mass, fat intake, and improve eating behavior.
Support (if any): NSTC (111-2314-B-002-293), NTU (107L900502, 108L900502, 109L900502), NTHU (109-42, 111-S0298, 111-X0033); MediaTek Inc. (201802034 RIPD)

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0561

CPAP TOLERANCE SCORES ARE EFFECTIVE IN PREDICTING CPAP USAGE IN THE SHORT-TERM

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Introduction: Our group previously presented work demonstrating the value of a 10-question CPAP tolerance survey in predicting therapy compliance at 30-90 days after CPAP prescription. We conducted a follow-up survey in the same cohort 6 months after CPAP prescription to examine the utility of the survey in predicting CPAP compliance.
Methods: This was a prospective study at a single tertiary care hospital. Patients diagnosed with clinically significant OSA (moderate disease, mild disease with symptoms, or mild disease with a comorbidity) between January-March 2023 that had initiated PAP therapy and attended a follow-up visit were provided a 10-question survey regarding symptoms and attitudes related to CPAP at their first follow up visit and again 6-9 months later. Data collected used for statistical analysis included: tolerance survey scores, CPAP usage, attendance of 6-month follow-up visit, demographics, OSA severity, and Epworth Sleepiness Scale (ESS) scores. Univariate and multivariate regression were used to analyze relationships between survey responses and CPAP usage data. Adherence was defined as using PAP therapy for ≥ 4hrs for ≥ 70% of nights in a 30-day period.
Results: Of the 105 respondents to the initial survey, 56 (53.3%) responded to the 6-month survey. Tolerance scores at 6-months correlated with % adherence at 6-months ($p = 0.02$) and minutes of CPAP usage at 6-months ($p = 0.04$). Each point of increase in 6-month survey scores was associated with an additional 2.7 minutes of use, on average. Initial tolerance survey scores did not significantly correlate with compliance 6-months later ($p = 0.17$). Initial tolerance survey scores did, however, correlate with tolerance survey scores 6 -months later ($ß = 0.77$, $p < 0.001$) and there was no significant difference between initial tolerance survey scores and scores at 6-months (mean difference -2.81, $p = 0.11$). Stepwise regression models showed minimized error when age, ESS at first follow-up, OSA severity and 6-month tolerance scores were used as covariates for an outcome of minutes of CPAP usage at 6-months.
Conclusion: CPAP tolerance surveys have utility in estimating CPAP compliance in the short-term but may not capture important changes in patient attitudes that allow for the prediction of long-term CPAP compliance.
Support (if any):

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0562

EVALUATION OF HABITUAL SLEEP DURATION AND PAP ADHERENCE TO QUANTIFY EFFECTIVE AHI REDUCTION AT HOME IN OLDER ADULTS

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Introduction: Any consequence of OSA treatment with PAP is likely to depend on baseline OSA severity and adherence to PAP in relation to habitual sleep duration. These variables can be combined to evaluate 1) the degree of effective residual AHI and 2) the degree of effective reduction in the AHI. We sought to characterize both of these outcomes in older adults newly diagnosed with OSA.
Methods: We recruited 19 patients (ages 55-85) from the Mount Sinai Integrative Sleep Center with a diagnostic PSG or WatchPAT showing AHI4% > 15/hour and willing to initiate PAP therapy. PAP adherence was obtained via remote monitoring after 3 months of use, and habitual sleep duration was obtained with 3-19 days of wrist actigraphy (ActiGraph). To account for differences between the AHI4% and the PAP-generated residual AHI, the AHI4% on PAP was considered 0/hour when the PAP-generated AHI was ≤5/hour or 5 units below the PAP-generated AHI when >5/hour. The effective residual AHI was defined as: ([AHI4% on PAP x usage hours] + [diagnostic AHI4% x (habitual sleep duration – usage hours)]) / (habitual sleep duration). Effective AHI4% reduction = diagnostic AHI4% - effective residual AHI4%. Wilcoxon signed rank tests were used to compare diagnostic AHI4% to the effective residual AHI4%.
Results: Mean age was 63±1.4 years, 37% were female, with mean BMI 33±1.7 and mean Epworth Sleepiness Score 6.5±0.7. Average habitual sleep duration was 5.8±0.3 hrs and average PAP use duration was 3.4±0.6 hrs. The median effective residual AHI4% was 9±20/hour, which was significantly lower than the diagnostic AHI4% (27±20/hour, $p=0.002$). The median effective AHI4% reduction was 15±23/hour, reflecting a mean 54±9% reduction from the baseline diagnostic AHI4%. Patients using PAP ≥ 6hrs (n=4) had an effective residual AHI4% of 1±2/hour (median diagnostic AHI4%: 29±24/hour), whereas patients using PAP < 2hrs (n=7) had an effective residual AHI4% of 24±17/hour (median diagnostic AHI4%: 24±37/hour).
Conclusion: This pilot study presents a characterization of the effective residual AHI and degree of effective AHI reduction in older sleep clinic patients prescribed PAP therapy. These values may be useful when considering health-related consequences of OSA treatment.
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0563

EXPLORING TRENDS OF ORONASAL VERSUS NASAL MASK USE BY SLEEP TECHNOLOGISTS

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Introduction: Continuous positive airway pressure (CPAP) therapy is the most prescribed therapy for obstructive sleep apnea (OSA). CPAP therapy has been shown to reduce daytime somnolence as well as reduce the risk of cardiovascular disease and mortality in patients with severe OSA and good adherence. Nasal and oronasal masks are the two main mask interfaces available for CPAP therapy. The oronasal mask is a larger interface and prior research shows that with an oronasal mask higher PAP pressures are needed compared to a nasal mask. These factors may reduce long-term adherence to CPAP when an oronasal mask is initially selected. There are no guidelines for sleep technologists when selecting a mask type during CPAP titration studies, however using an oronasal mask could affect the long-term adherence to CPAP therapy.
Methods: We retrospectively studied mask selection amongst our sleep technologists from 6/15/2023 to 9/30/2023. Our institution employs 12 sleep technologists; 6 work at lab 1 and 6 work at lab 2.
Results: Overall, 368 patients (199 at lab 1 and 169 at lab 2) underwent CPAP titration studies during the study period. There were no significant differences in patient demographics between the two sleep labs, including mean age (57.3±14.8 vs 57.2±14.9, p=0.95), sex (48% female vs 48% female, p=0.97) and mean BMI (39.6±19.4 vs 38.6±10.7, p=0.38). The prevalence of oronasal mask use was significantly higher at the lab 2 compared to the lab 1 (45% vs 30%, p=0.002).
Conclusion: Oronasal masks are still frequently used by our sleep technologists during CPAP titration studies. There was significant variation in the use of nasal versus oronasal masks by sleep technologists, even between two sleep lab sites that are part of the same institution. An educational program geared toward sleep technologists may reduce the use of oronasal masks during CPAP titration studies which may further improve the adherence to CPAP therapy.
Support (if any):

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0564

GROUP MOTIVATIONAL INTERVIEWING TO IMPROVE APAP ADHERENCE: A QUALITY IMPROVEMENT PROJECT

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Introduction: Automatic positive airway pressure (APAP) adherence to treat obstructive sleep apnea (OSA) is challenging to many patients. Motivational interviewing in one-on-one sessions has been shown to improve rates of APAP adherence. The goal of our improvement study was to improve APAP adherence and determine whether motivational interviewing is effective in a group setting.
Methods: Patients with a new diagnosis of OSA, regardless of severity, presented to our academic sleep disorders center for a group presentation on OSA and available treatments from November – December 2023. Groups of 5-10 patients received either a standard informative presentation or the same presentation with motivational interviewing techniques. Questionnaires with a Likert scale from 1 to 10 assessed pre- and post-presentation readiness to undergo treatment for their OSA and perceptions of importance to treat. Post-presentation questionnaires also included questions on likeliness to pursue treatment and confidence to pursue treatment.
Results: A total of 41 patients attended the group session with 53.6% (n=22) receiving the motivational interviewing component. For the motivational interviewing group, adherence data post-intervention revealed that the average total days of APAP use was 79%, average total hours used was 232.00 minutes, and average use greater than 4 hours was 51.6%. For the non-motivational interviewing group, adherence data post-intervention showed that the average total days of APAP use was 68.62%, average total hours used was 209.62 minutes, and average use greater than 4 hours was 46.54%. To date, 38% of non-motivational interviewing patients (n=13) were adherent by Medicare definition, compared to 40% of motivational interviewing patients (n=5). Questionnaires had equivocal scores in all categories pre- and post-presentation for the motivational interviewing and non-motivational interviewing groups and indicated a high level of motivation to pursue therapy.
Conclusion: Implementing motivational interviewing in a group setting was a feasible way to improve APAP adherence in our clinic. Patients are motivated to pursue APAP therapy in pre- and post-presentation questionnaires. This preliminary data is limited by ongoing intervention implementation yet promising for the use of motivational interviewing in the group setting. To the authors knowledge, no published improvement projects exist for evaluating the effectiveness of motivational interviewing in a group setting.
Support (if any):

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0565

UTILIZATION OF PAP TITRATION AS INDICATOR FOR PREDICTION OF PAP ADHERENCE

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Introduction: Patient characteristics like self-efficacy, daytime sleepiness, and obstructive sleep apnea (OSA) severity are associated with positive airway pressure (PAP) treatment adherence. We examined the association of changes in sleep architecture with PAP titration on split-night polysomnography (PSG) with PAP adherence in an urban, racially diverse population.
Methods: PSG conducted between January and December 2019 were reviewed for sleep architecture data. The main variables were change in sleep efficiency (SE), arousal index (AI), N1, N3, and REM sleep. Changes were assessed as ratios and differences (therapeutic/diagnostic and therapeutic-diagnostic). Demographic data, body mass index (BMI), social vulnerability index (SVI), apnea hypopnea index (AHI), Epworth Sleepiness Scale (ESS), and the initial 90-day adherence data from PAP download were collected. PAP adherence was defined as ≥4 hours/day use for ≥70% days. Stata v17 was used for analysis.
Results: PSG was conducted in 381 patients, and 239 patients had complete data for PAP use. The baseline characteristics

of analyzed patients (N=239) were not significantly different from the missing sample (N=143). The PAP adherent group (N=109) were similar to the non-adherent group (N=130), except for a higher baseline ESS was noted in the adherent group (p=0.01). The logistic regression model showed that increasing age and lower ESS were associated with greater likelihood of PAP adherence (Odds Ratio, OR 1.02,95% confidence interval, CI 1.00-1.05 and OR 0.94, CI 0.89-0.99). Regarding the changes in sleep architecture with PAP titration, increases in SE and N3 sleep during the titration portion of the PSG were associated with higher likelihood of PAP adherence (OR 1.01, CI 1.00-1.03 for each). Changes in AI, N1, and REM sleep were not associated with PAP adherence.

Conclusion: Improvements in SE and an increase in N3 sleep during PAP titration on split-night PSG are associated with a higher likelihood of PAP adherence.

Support (if any):

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0566

UTILIZING A TRIAGE TOOL QUESTIONNAIRE TO IDENTIFY PAP-RELATED ISSUES IN PATIENTS NEWLY-INITIATED ON THERAPY FOR OSA

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Introduction: Developing strategies to enhance Positive Airway Pressure (PAP) adherence is crucial for improving outcomes in patients with obstructive sleep apnea (OSA). We introduce a novel Triage Tool (TT) questionnaire designed to identify specific usage challenges to facilitate targeted interventions.

Methods: Moderate-severe OSA (AHI≥15) patients newly-initiated on PAP therapy (AutoCPAP, ResMed) were enrolled (Kaiser Permanente, Fontana, CA). A digital platform (Somnoware, Inc.) emailed patients a link to the electronic TT questionnaire at 5, 10, and 30 days post-treatment initiation. The 31-item TT is comprised of 6 domains: Adverse Effects, Pressure, Mask/Device, Disturbed Sleep, Psycho-social, and Unintentional. A Likert scale (1 – 4) was used where '1 = not at all' and '4 = a lot' in response to "how much does this issue bother you?" We characterized the frequency of issues in the overall group and between adherent (Adh) and non-adherent (NA) subgroups (adherent: ≥70% usage, ≥4 hours over 30 days), using descriptive statistics.

Results: Of 150 enrolled patients (age 48±14; male 58%; AHI 41.1±21.1), 73 were Adh and 77 were NA. Overall TT response rate was 57% (63, 60, 50%, respectively, at day 5, 10, 30) and higher for Adh than NA (70.3% ± 5.0 vs 45.9% ± 6.7) Average number of patient endorsed issues (i.e., responses scored 3 or 4) was higher for NA than Adh and decreased over time – day 5: 4.1 ± 4.2 vs 3.4 ± 4.1; day 10: 3.9 ± 5.4 vs 2.8 ± 3.6; day 30: 2.5 ± 5.4 vs 2.2 ± 3.6. Commonly endorsed issues were: dry throat/mouth (21%), waking too early (20%), mask discomfort (19%), nasal congestion (18%), and difficulty initiating sleep (16%). NA patients additionally endorsed difficulty falling (23%) and staying (19%) asleep, waking with mask off (19%) and embarrassment (23%) or concern about appearance (23%). Adh patients more frequently concerned about traveling with PAP (20%).

Conclusion: The TT questionnaire identified "mask/device" discomfort and "adverse effects" as commonly endorsed problems among newly-treated OSA patients. NA patients also reported "disturbed sleep" and "psychosocial" barriers. Identifying specific treatment-related problems experienced by individuals may guide targeted interventions. Further psychometric evaluation is underway to refine the TT questionnaire.

Support (if any):

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0567

UTILIZING MACHINE LEARNING BASED ON MULTI-MODAL DATA TO PREDICT PAP ADHERENCE IN PATIENTS WITH OSA

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Introduction: Predicting future Positive Airway Pressure (PAP) adherence may support treatment decisions and timing of interventions in patients with obstructive sleep apnea (OSA). We developed machine learning (ML) prediction algorithms based on daily PAP metrics and diagnostic sleep study data to predict adherence at 3-months and 1-year.

Methods: ML models (eXtreme Gradient Boost) were trained on a dataset of 37,076 patients (Kaiser Permanente, Southern California) that comprised of daily PAP data ("usage" [minutes/night] and "leak") and diagnostic sleep study data (Polysomnography and Home Sleep Apnea Tests). Models were trained to predict PAP adherence (≥70% days, ≥4 hours) at 3-months (i.e., 61-90 days) and 1-year (i.e., 330-360 days) after PAP initiation. Developed algorithms were based on: (a) Usage; (b) Leak; (c) Diagnostic sleep study data (i.e., AHI, oximetry metrics, sleep-wake metrics); (d) combination of those data types. For the models utilizing daily PAP data, different input days were applied (i.e., 7, 30, 90, etc.) to the training.

Results: Models based on daily usage alone demonstrated excellent predictive performance with relatively short input days (ROC-AUC 0.86 and 0.96 in predicting 3-month adherence utilizing 7 and 30 input days; 0.74, 0.82, 0.88 in predicting 1-year adherence utilizing 7, 30, and 90 input days). Models based on daily leak demonstrated more modest performance (0.69 and 0.83 predicting 3-month adherence with 7 and 30 input days; 0.60, 0.70, 0.80 predicting 1-year adherence with 7, 30, 90 input days.) Models based only on diagnostic sleep study data (without PAP data) demonstrated only small but similar 3-month and 1-year predictive accuracy (0.57 and 0.56, respectively). The addition of leak and sleep study data to usage did not significantly improve performance.

Conclusion: ML algorithms based on daily usage data early after therapy initiation can accurately predict future adherence to at least 1 year after therapy, enabling decision support after starting PAP. Algorithms using sleep study data could enable treatment decisions prior to prescribing PAP, but performance was modest. Whether the addition of electronic health record or direct ML processing of raw sleep study data could improve predictive accuracy requires further exploration.

Support (if any): AASM Foundation 205-SR-19

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0568

PROMOTING SHARED DECISION MAKING WITH A NOVEL SELF-MONITORING PROGRAM FOR VETERANS WITH OBSTRUCTIVE SLEEP APNEA

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Introduction: Optimal shared decision making (SDM) occurs when patients are well-informed about their treatment options and, with clinician collaboration, can determine the best care for their well-being. Data pertaining to treatment success guide future decisions on care management, such as the decision to continue with current therapy versus transitioning to alternate therapies. Unfortunately, patients with obstructive sleep apnea (OSA) on non-positive airway pressure (non-PAP) treatments (e.g., dental devices) often lack night-to-night data supporting therapy effectiveness. We designed a self-monitoring program that provides night-to-night data for Veterans on non-PAP OSA treatment, with the goal of promoting SDM.
Methods: Patients with OSA prescribed non-PAP treatment from a VA sleep center were invited to participate in a quality improvement project for 1, 2, or 4 weeks, depending on project phase. A consumer-grade smartwatch was provided to each patient to collect pulse oximetry (SpO2) data while sleeping. Patients completed a weekly survey on their daytime sleepiness, mood, daily functioning, and use of non-PAP treatment. A report with their survey responses and SpO2 data was sent to patients weekly. A sleep clinician met with patients to discuss the report and OSA treatment. We assessed SDM with CollaboRATE-5 (3-items, score range 0-12, 0=no effort was made, 12=every effort was made). We conducted post-program semi-structured interviews with patients and analyzed interview data using content analysis to infer themes and/or meanings of SDM.
Results: Out of 11 veterans enrolled in the program (1 [9.1%] female, mean age 54, 7 [63.6%] non-white or multiracial), 9 (81.8%) have completed the program. Qualitative analysis revealed 3 themes related to SDM: 1) Information provision; 2) Patient preference elicitation; and 3) Patient preference integration. Four of 9 participants mentioned that they would reconsider PAP therapy at the conclusion of the program. A mean CollaboraRATE score of 7.1 (SD=3.0) indicates that respondents felt the program made some effort to address their concerns and integrated their preferences in OSA treatment.
Conclusion: Implementing a self-monitoring program as part of OSA treatment has promoted SDM with nearly half of patients expressing an interest to retry or consider PAP treatment.
Support (if any): VA Office of Connected Care

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0569

BREATHING EASY TOGETHER: HOW POSITIVE AIRWAY PRESSURE ADHERENCE BENEFITS BOTH PATIENTS AND PARTNERS

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Introduction: Emerging research highlights the interdependence of sleep within couples and the impact of sleep and sleep disorders on couples' relationship quality. The current study examines how adherence to positive airway pressure (PAP) as well as sleep duration and efficiency associates with both patient and partners' relationship quality, among patients with obstructive sleep apnea (OSA) and their partners.
Methods: The sample included OSA patients initiating PAP treatment and their partners (N= 36 couples; mean age = 63.06, SD = 9.15). Mixed model analyses examined actor and partner effects of PAP adherence and actigraphy-assessed sleep duration and efficiency, on patient and partners' self-reported relationship satisfaction and conflict.
Results: Greater patient PAP adherence (defined as > 4 hours use per night on average over 3 months of recording) was associated with higher levels of relationship satisfaction (B = 4.26; SE = 1.40; p = 0.01) and lower levels of relationship conflict (B = -5.24; SE = 2.51; p = 0.04) for patients and partners. Higher patient sleep efficiency was associated with higher levels of patient and partner reported relationship satisfaction (B = 0.12; SE = .06; p = 0.04). Associations involving sleep duration were significantly different for patients and partners. For patients, greater own total sleep time was significantly associated with higher levels of patients' relationship satisfaction (B = 0.92; SE = 0.35; p = 0.01) whereas greater partner total sleep time was significantly associated with lower levels of patients' relationship satisfaction (B = -1.35; SE = 0.67; p = 0.045). After adjusting for patient adherence, the magnitude and direction of these associations were similar but the p-values increased slightly (p = 0.085 for sleep efficiency; p = 0.054, 0.14, 0.12, respectively for sleep duration).
Conclusion: Results highlight how sleep and sleep disorders are implicated in couples' relationship quality. Among couples in which one member has sleep apnea, adherence to PAP treatment and better sleep efficiency is associated with higher relationship satisfaction. Recognizing the dyadic implications of sleep and sleep disorders, including the potential impact on relationship quality, may be a powerful motivator to encourage adherence in sleep disorders populations.
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0570

IMPACT OF A SLEEP APNEA MANAGEMENT GROUP CLINIC ON PAP ADHERENCE AND PROS: A RANDOMIZED CONTROLLED TRIAL

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Introduction: Positive airway pressure (PAP) is the mainstay treatment for obstructive sleep apnea (OSA), yet suboptimal adherence limits treatment effectiveness. We examined the impact of a sleep apnea management (SAM) clinic, an innovative, interactive group clinic which provides interpersonal support to patients and allows access to resources and education,

on PAP adherence and patient reported outcomes (PROs) compared to usual care.

Methods: Participants with OSA and newly prescribed PAP therapy and sub-optimally adherent (CMS criteria) during the first two weeks, were randomized to SAM clinic(n=26) versus usual care(n=30) from April 2019 to November 2022 (NCT-03835702). The primary outcome was change in average daily PAP usage, whereas secondary outcomes were changes in Epworth Sleepiness Scale (ESS), Patient Health Questionnaire-9 (PHQ-9), and PROMIS scales from baseline to 1 and 3 months. Baseline adjusted mixed effect linear and logistic models estimated between and within groups differences.

Results: A total of 56 participants were enrolled with a mean age of 55 years, 57% female, 63% Caucasian, median AHI of 22.8 (9.3,39.6), and median baseline PAP usage of 172 minutes. After 3 months, the mean (95% CI) SAM clinic daily PAP use was 193(139, 247) minutes vs usual care at 148(110, 185) minutes with mean difference of 46(-8, 99) minutes per day (p=0.093). Within each group, a mean daily difference of 11(-36,57) minutes (p=0.65) in SAM clinic and -32(-75,12) (p=0.15) in the usual care was observed. No significant differences were observed in PROs between SAM and usual care. Within each group, ESS change was -0.7(-2.5,1.2) (p=0.48) in SAM clinic and -2.5(-4.2, -0.83) (p=.004) in usual care. Significant decrease was noted in PHQ-9 within both SAM clinic at-2.2(-3.9, -0.4) (p=0.019) and in usual care at -2.3(-4.0, -0.7) (p=0.006). Improvement in PROMIS sleep related impairment was noted within both groups: SAM clinic at -3.0(-6.2,0.1) (p=0.059) and usual care group at -3.5(-6.4, -0.60) (p=0.019). Similar changes in PAP adherence and PROS were seen at the 1-month follow-up.

Conclusion: SAM clinic may improve PAP adherence and some PROs better than usual care; however future studies are needed to confirm findings as this trial was underpowered due to premature termination resulting from the pandemic.

Support (if any):

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0571

IMPACT OF CPAP ADHERENCE ON OBJECTIVE AND SUBJECTIVE SLEEPINESS MEASURES

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Introduction: Sleepiness, a common symptom of various sleep disorders, has been subjectively measured using the Epworth Sleepiness Scale (ESS) and objectively quantified using the Psychomotor Vigilance Test (PVT). The relative merit of these two measures of sleepiness has been debated, and both have shown inconsistent relationships with severity of obstructive sleep apnea (OSA) and responses to treatment. We report the relative associations of ESS and PVT with hours of CPAP use within a clinical sample.

Methods: Patients being evaluated for sleep disorders at the University of Pennsylvania's Sleep Center competed both the ESS and PVT measurements in a single clinical visit. Thirty-nine patients had a diagnosis of OSA and were currently using CPAP. Pearson's correlations were utilized to examine the association between CPAP adherence and both the ESS and PVT measures (transformed lapses [sum of square root of number of lapses and square root of lapses+1]) and mean reciprocal response time (RRT).

Results: total of 39 patients (64.1% males; 52.6% White, 39.5% Black) were studied, with a mean (SD) age of 61.1 (16.4) years and BMI of 35.2 (9.5) kg/m2; residual apnea-hypopnea index (AHI) was 6.5 (10.8) events/hour (23 [63.9%] had residual AHI < 5 events/hour). Participants used CPAP an average of 5.87 (2.27) hours/night in the past 30 days, 5.87 (2.47) hours/night over the past 7 days, and 5.91 (2.86) hours/night the day prior to ESS/PVT measurement. Overall, we observed a strong correlation between less subjective sleepiness based on ESS and more CPAP usage at 30-days (rho = -0.48, p=0.002), 7-days (rho = -0.43, p=0.006) and the prior day (rho = -0.38, p=0.017). However, there was no correlation between hours/night of CPAP adherence and objective function as measured on PVT.

Conclusion: Among patients with OSA using CPAP evaluated at University of Pennsylvania's Sleep Center, greater amounts of CPAP use were significantly associated with lower ESS scores (e.g., less sleepiness). Conversely, no significant correlations were observed between CPAP use and objective data on PVT. Larger studies examining the causal effects of CPAP on subjective and objective sleepiness, including with repeat assessments of ESS and PVT during therapy, are warranted.

Support (if any):

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0572

IMPACT OF CPAP THERAPY ON HBA1C IN PATIENTS WITH OBSTRUCTIVE SLEEP APNEA AND PRE-DIABETES: A PRELIMINARY ANALYSIS

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Introduction: Patients with Obstructive Sleep Apnea (OSA) have higher levels of inflammatory cytokines, like tumor necrosis factor α (TNF-α) and interleukin-6 (IL-6). Similar higher systemic inflammatory cytokines have been linked to insulin resistance, thus emphasizing possible metabolic complications of OSA. Yet, the effect of positive airway pressure (PAP) therapy on glycemic control in those with concomitant OSA and pre-diabetes i unknown.

Methods: We performed a retrospective cohort study analyzing data from our tertiary care sleep center in adults with OSA and concomitant prediabetes who were initiated on CPAP therapy between April 2018 to April 2021. OSA was identified using ICD-9-CM (327.23) and ICD-10code (G47.39). Prediabetes was defined as hemoglobin A1c (HbA1c) between 5.7–6.4%. Demographic data were collected including age, gender, BMI, and number of comorbidities. The data was stratified among those on medications for pre-diabetes versus those that were not on any medications for it. Our outcome of interest was the change of mean A1c after CPAP initiation. Descriptive statistics were performed, while t-test was used to assess the changes of mean A1c values before and after CPAP treatment with a statistically significant level $p < 0.05$

Results: A total of 71 patients were included in the current analysis. The average age was 61.53 years, and 65% were female, while 44% non-Hispanic whites, 28% non-Hispanic blacks, 21% Hispanics and 6% Asians. Among those with concomitant OSA-prediabetes on medications, the mean HbA1c before CPAP initiation was 6.03% which changed to 6.63% after CPAP initiation

over a mean follow up duration of 485 days (p=0.04 from one-tail t-test). Among those with concomitant OSA-prediabetes not on medications, the mean A1c before CPAP initiation was 6% which marginally had changed to 6.42% after CPAP therapy over mean follow up duration of 447 days (p=0.05 from one-tail t-test), again remaining within pre-diabetes range.
Conclusion: Our results show that HbA1c remain stable within pre-diabetes range in patients with concomitant OSA and pre-diabetes using CPAP therapy. Some limitations could be retrospective nature of the study, small sample size, lack of CPAP compliance data. Larger prospective studies are suggested to further investigate the effect of CPAP on progression to diabetes among these patients.
Support (if any):

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0573

MORNING QUESTIONNAIRE POST-PAP TITRATION AS A PREDICTION TOOL OF EARLY PAP ADHERENCE

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Introduction: Positive airway pressure (PAP) therapy is first line treatment for obstructive sleep apnea (OSA). Challenges however exist in regard to optimal PAP adherence. Patterns of PAP adherence in the first month of device use can predict long-term adherence. We investigated the corelation between immediate PAP acceptance, measured by the morning PAP titration questionnaire (MPQ), administered immediately after the titration, and the initial 90-day PAP adherence.
Methods: We performed a retrospective review of patients who completed a PAP titration between January and June 2023 at Memorial Hermann Sleep Disorders Center - Texas Medical Center. Initial 90-day adherence (defined as usage ≥4 hours/night for ≥70% of nights) was obtained on each patient. The patients were grouped based on optimal adherence (Group 1) versus non-adherence (Group 2). The MPQ score was obtained for each patient (completed on the morning after the titration). The MPQ included 4 questions (sleep quality, morning alertness, PAP tolerance, likelihood of device usage) with each affirmative response receiving 1 point. An MPQ score of ≥3 was established as significant for PAP acceptance.
Results: A total of 20 subjects were analyzed with the following characteristics: Group 1 - N 10 (7 men, 3 women), mean age 66 years, mean AHI 43/hour of sleep. Group 2 - N 10 (8 men, 2 women), mean age 63 years, mean AHI 35/hour of sleep. In Group 1, 80% (8 patients) had a score ≥3 compared to 50% patients (5 patients) in Group 2. MPQ scores of 3 and 4 conferred the highest 90-day adherence (62% and 81% respectively). A significant MPQ score also translated into an 82% positive predictive value for PAP adherence in the initial 90 days.
Conclusion: Our results show that patients with a significant MPQ score of ≥3 post-PAP titration are more likely to adhere to PAP therapy than those with non-significant scores and this can hence be used to predict immediate (and potentially long-term) adherence patterns. This simple questionnaire can be implemented to guide strategically timed early follow up and interventions (amongst those who score < 3) to best utilize limited sleep resources and reduce the prevalence of PAP non-adherence.
Support (if any):

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0574

AN INTERVENTION TO PROMOTE POSITIVE AIRWAY PRESSURE (PAP) USE: QUALITATIVE ANALYSIS OF BARRIERS AND FACILITATORS

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Introduction: Health literacy of sleep apnea (SA) and access to behavioral strategies to promote positive airway pression (PAP) adherence remain challenges in clinical settings. Understanding what factors hinder or support PAP use is critical to increasing adherence and optimizing patient outcomes. We developed and implemented a brief PAP education and behavioral intervention program (1-hour 1:1 telehealth session prior to initiating PAP and 1-week follow-up call) in a VA sleep medicine clinic to increase SA knowledge and PAP use. To evaluate the program, we collected qualitative feedback from participants.
Methods: The PAP program was offered to Veterans newly diagnosed with SA. Among 43 veterans who participated in the program, 10 completed the Self-Efficacy Measure for Sleep Apnea (SEMSA) prior to program initiation and provided retrospective qualitative feedback within 6 months of initiating PAP. Three raters independently coded qualitative responses and reached consensus on domains and subcategories that emerged.
Results: Veterans (M=56 years) were categorized as "low" (n=5) or "high (n=5)" based on mean SEMSA perceived risk subscale score. Qualitative analysis revealed 3 domains (pre-program SA knowledge, pre-program PAP knowledge, and post-program SA/PAP knowledge) and categories of barriers or facilitators emerged. Four out of the 5 participants in both groups reported a perceived lack of knowledge of SA before the PAP program (unaware of SA-associated health risks). Despite this perception, the high group reported more pre-program basic knowledge about PAP vs. the low group, and knowing a family/friend with a neutral/positive PAP experience. Two participants in the low group expressed negative PAP-related expectations/cognitions vs. no participants in the high group. Participants in both groups reported having increased knowledge about SA/PAP post-PAP program; however, only participants in the low group recalled specific skills/strategies to facilitate PAP use.
Conclusion: Qualitative feedback revealed a general lack of knowledge about SA pre-PAP education program. A PAP education program may help those newly diagnosed with SA increase their health literacy and learn skills/strategies to facilitate PAP use, particularly for those who have a lower risk perception of SA. Future research should explore the impact of negative SA/PAP-related perceptions on PAP adherence.
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0575

PARALLEL COMPARISON OF APNEA HYPOPNEA INDEX WITH WATCHPAT AND CPAP COMPLIANCE DOWNLOAD

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Introduction: Some OSA patients have sleep associated hypoxemia, defined as time spent with oxygen (O2) saturation □88% for > 5 minutes (T88). Positive airway pressure (PAP) is the gold standard treatment for OSA. Apnea-Hypopnea index (AHI) estimation from PAP download (DL) is used by clinicians to determine the treatment efficacy. Overnight oximetry with PAP therapy is usually used to check for resolution of hypoxemia. During the COVID-19 pandemic, we used WPAT to check for resolution of hypoxemia in OSA patients who were prescribed PAP therapy. However, this practice change allowed us to compare the AHI measured simultaneously by WPAT and PAP DL
Methods: A retrospective study of 42 patients from August - November 2021 seen at University of Minnesota Sleep Clinic. All patients had a previous diagnosis of OSA and sleep associated hypoxemia confirmed by either Noxturnal [Nox MEDICAL] HSAT or PSG. All patients were being treated with either CPAP or bilevel PAP. Single night of HSAT was obtained with WPAT 100 (Itamar Medical) while simultaneously using PAP at their usual prescribed settings. PAP data included usage time, adherence, 30-day and same night AHI. WPAT data included total AHI, rapid eye movement related AHI, and T88
Results: Of the 42 patients, 60% were males with mean age 58.8 ± 14.6 years, body mass index (BMI) 38.9 ± 9.6 kg/m2 and Epworth sleepiness scale 10.7 ± 5.1. We identified an elevated AHI (≥ 5) with WPAT in more than half of the patients though hypoxemia resolved, ESS improved and OSA was optimally controlled with AHI< 5 per PAP DL. There was a significant difference between the AHI on WPAT and same day PAP DL (AHI; 7.9 ± 12.2; p =0.0006). There was moderate correlation with BMI (r=0.51; p= 0.0017) and poor correlation with central AHI on WPAT (r = 0.29; p= 0.10)
Conclusion: There was discrepancy between AHIs with results from WPAT and PAP DL measured during the same night. Higher residual WPAT AHI could have significant implications with regards to validity of the algorithm used in these devices. This can potentially lower the threshold for performing titration PSGs to ensure optimal treatment of OSA
Support (if any):

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0576

PATIENT PERCEPTION OF SLEEP MEDICINE DURING HOSPITALIZATION AND TREATMENT OF DIAGNOSED SLEEP APNEA

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Introduction: Screening for sleep apnea among hospitalized patients has been shown to help practitioners identify sleep apnea and improve patients' outcome. Patient perception of this intervention from the sleep medicine team has never been examined in a hospital setting. In this study, we examined the attitudes patients held about their diagnosis of sleep apnea and the team working with them.
Methods: Between June 2023 and November 2023, 152 consecutive patients, screened for sleep apnea, went through a sleep study. A carefully designed questionnaire was adapted from the validated Obstructive Sleep Apnea Knowledge and Attitudes (OSAKA) questionnaire. The survey was intended to understand patients' beliefs on the importance of sleep apnea and their perception of the sleep medicine service. One question was designed to determine the patients' confidence with using the CPAP therapy. The responses were then analyzed.
Results: Of the 152 patients interviewed, the mean age was 60 years (15) and 59% were female. The average BMI for these patients was 39.2 (20.5). 76% (n=115) mentioned they were aware of sleep apnea before the sleep medicine team's assessment. On a 5-point scale, 87% of patients ranked at least "3" (important) for the importance of knowing whether they had sleep apnea. Of the subset of patients (n=26) who were prescribed CPAP therapy in the hospital, 63% indicated they at least "agreed" (3 on 5-point scale) with confidence on their ability to use a CPAP device at home.
Conclusion: Our analyses signify most hospitalized patients who underwent sleep apnea screening and evaluation perceived sleep apnea is an important condition and exhibit a constructive attitude towards the sleep medicine team and CPAP therapy. Moreover, a significant number were aware of the condition among their immediate family and community. With patient education and guidance provided by the sleep medicine team, the patients developed a constructive understanding of their diagnosis and how to manage OSA using CPAP therapy. Thus, this study suggests that hospitalized patient's knowledge of OSA is high, and patients are receptive to pro-active work up.
Support (if any):

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0577

WOMEN'S PERSPECTIVES OF RECEIVED SUPPORT WHEN INITIATING CONTINUOUS POSITIVE AIRWAY PRESSURE (CPAP) TREATMENT

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Introduction: Women are less adherent to CPAP than men, but the reasons are unclear. Our goal was to qualitatively explore women's perceptions of support from their healthcare provider, durable medical equipment (DME) company, and family or friends during the initiation and continuation of CPAP treatment.
Methods: We conducted 28 semi-structured interviews with women diagnosed with OSA who via self-report were using CPAP every night (n=11), using CPAP intermittently (n=8), or had discontinued use (n=9). The women had mean age ± SD = 51 ± 15, were 29% Black, 71% White, and OSA severity was 40% mild, 21% moderate, 25% severe, 14% unknown. Interview questions were structured to elicit the women's detailed experiences and perceptions of support while beginning CPAP treatment. Two independent reviewers analyzed responses using a thematic approach that identified the major conceptual categories.
Results: All the women described overcoming challenges when initiating CPAP treatment, in particular those related to mask fit and discomfort, machine set up, and receiving adequate support when problems arose. In their descriptions of how they solved their challenges, three themes emerged: 1) Self-advocacy was essential, yet many women hesitated to ask for continued support, 2) Tenacity and 'trial and error' were crucial to overcoming challenges, 3) Desire for live support including video calls for demonstration of CPAP set up and also general coaching

or reinforcement. Women who consistently used CPAP every night, were more likely to discuss overcoming challenges during treatment initiation compared to those who had discontinued its use or were using it intermittently. The consistent CPAP users also discussed receiving support from various sources, particularly their DME company, but also healthcare providers, friends, family, and even Facebook groups; in contrast the women who discontinued its use were less likely to discuss receiving support outside an initial call to their DME.
Conclusion: Women had to actively pursue support and information that wasn't readily available during initiation and continuation of CPAP treatment, potentially creating a deterrent to its use. Tailored support may be necessary to assist women in overcoming challenges during the initial stages of treatment.
Support (if any): University of Pittsburgh, School of Nursing, Center for Research and Evaluation

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0578

FEASIBILITY AND PRELIMINARY EFFICACY OF WEPAP, A DYADIC TRANSDIAGNOSTIC INTERVENTION

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Introduction: The goal of this study was to examine feasibility, acceptability, and preliminary efficacy of WePAP, a novel, couples-based treatment to promote positive airway pressure (PAP) adherence in patients with obstructive sleep apnea (OSA) and sleep quality in patients and partners.
Methods: Patients who were recently diagnosed with OSA and starting PAP and their partners completed pre- and post-treatment self-report measures of study constructs and actigraphy. Couples were randomly assigned to WePAP or information control (IC) groups. Post-PAP assessments and adherence downloads were completed at 1 and 3 months. The main outcomes were feasibility and acceptability ratings. Preliminary efficacy outcomes included: patient PAP adherence and subjective and actigraphy-assessed sleep in patients and partners. Secondary outcomes included depression, quality of life, relationship, and cognitive functioning.
Results: The study enrolled 37 couples (age m= 62.97; SD=9.04). All WePAP couples attended each of the three sessions. Compared to the IC group, patients and partners in WePAP rated the intervention more favorably and were more satisfied. Among the primary efficacy outcomes, PAP adherence was high in both groups (PAP use >4 h= 85% in WePAP and 77% in IC). There were significant within-group differences for subjective sleep, such that patients in both groups showed significant reductions in sleep disturbance at 3-months. In addition, patients in both groups and partners in WePAP showed significant reductions in sleep related impairment at 3-months. Among secondary outcomes, patients in both WePAP and IC showed significant improvements in depression and QOL. WePAP patients also showed small but significant improvements in a measure of processing speed and attention. There were no within- or between-group changes in relationship quality.
Conclusion: Results demonstrate that WePAP is feasible and well-liked by patients and partners, but did not demonstrate greater adherence or improved sleep quality in this sample of highly adherent patients. Future studies should examine longer-term outcomes and enroll patients at greater risk for non-adherence to PAP.
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0579

ELECTRODE CONFIGURATION EFFECT ON USAGE AND SELF-TITRATION

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Introduction: Hypoglossal nerve stimulation (HGNS) for obstructive sleep apnea uses an implanted pulse generator with a stimulation lead cuff wrapped around the hypoglossal nerve. The cuff includes three stimulation electrodes configured to +-+ by default but can be customized by a physician, for example to -+-, or a unipolar configuration using the generator as an electrode. Patients activate their therapy nightly with a button press on a short-range telemetry remote. With this remote, patients can titrate the therapy amplitude by increasing or decreasing 0.1V steps. Patients have reported that unipolar stimulation "feels" stronger per step than bipolar. To test this hypothesis, we analyzed the impact of default vs custom electrode configuration on nightly device usage and amplitude increase trajectory.
Methods: Device settings and usage pulled from the manufacturer's cloud data system, SleepSync (Inspire Medical Systems Inc., Golden Valley MN), since 2018. 24322 patients with a full 90 days of usage data and without adjustments to their stimulation settings (pulse width 90μsec, pulse rate 33Hz) during the 90 days were selected and divided into cohorts based on initial programming to default vs custom electrode configuration (958 patients unipolar, 37 -+-). Usage was calculated as hours of daily therapy. Amplitude increase was calculated as the number of titrated steps up. Usage and amplitude increase were averaged per patient and reported as mean ± standard deviation, and T-tests were used for comparisons.
Results: In all patients, mean pre-implant AHI and ESS were 34.5±15.5 and 10.1±6.4, respectively. Mean BMI and Age were 28.9±3.5 and 62.4±12.2, respectively. Therapy usage with default polarity was higher than custom (6.21±1.67 hrs vs 5.63±1.92, 95% CI=[0.47,0.68]). Patients were able to increase amplitude with default polarity by more steps vs. custom (9.33±10.35 steps vs 6.65±10.61, 95% CI=[2.02,3.34]).
Conclusion: Both device usage and amplitude increase were higher in patients who retained the default electrode configuration vs patients who switched to a custom configuration, confirming hypothesis that the sensation of higher stimulation intensity is larger per step in unipolar configurations. Solutions to provide finer granularity of amplitude increases may improve usage in unipolar configurations.
Support (if any): Employees of Inspire Medical Systems contributed to the data analysis.

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0580

PREDICTORS OF PAP COMPLIANCE ONE MONTH AFTER BARIATRIC SURGERY

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Introduction: Obesity is a major risk factor for Obstructive sleep apnea (OSA). Bariatric surgery is a popular treatment modality for sustainable weight loss in obese patients with OSA. Meta-analysis of several randomized controlled trials and observational studies showed that bariatric surgery led to improvement in OSA severity but not cure. These patients will likely need continued treatment for OSA to minimize its complications. It is unclear what factors influence positive airway pressure (PAP) therapy adherence and compliance postoperatively. Our study aims to identify predictors of PAP compliance 1 month after bariatric surgery.
Methods: Patients who underwent bariatric surgery at our institution between April and October 2023 and had diagnosed obstructive sleep apnea were identified. The 140 patients were followed prospectively through surgery and 30-day post-surgery. Medical health records, polysomnography or home sleep study results, and on-line databases of PAP use were reviewed for each patient. We used Pearson correlation coefficient testing and t-test to examine potential predictors of PAP use in the 30-day post-operative period.
Results: There are statistically significant correlations ($p < 0.05$) between post-surgical PAP use and use during 7 days of initial set up ($r = 0.642$), time spent below 90% SpO2 during sleep testing ($r = 0.425$), time spent below 88% SpO2 ($r = 0.246$), pre-operative STOP-BANG ($r = 0.200$), and time from sleep testing to surgery ($r = 0.242$). Pre-surgical AHI and having been evaluated by a sleep physician pre-operatively did not show statistically significant association with post-operative PAP use.
Conclusion: PAP use during 7 days of initial set up is highly predictive of 1-month post-operative PAP use and may serve as a valuable marker to intervene on those patients with low use to improve long-term PAP use. Patients who were diagnosed with OSA close to their surgery had lower PAP use, suggesting patients may benefit from more time to get used to the treatment before having surgery.
Support (if any):

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0581

EVALUATING THE USABILITY AND PERFORMANCE OF A PAP MASK SYSTEM IN THE HOME ENVIRONMENT

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Introduction: Positive airway pressure (PAP) therapy is the first-line therapy treatment for obstructive sleep apnea (OSA); however adherence remains challenging. A comfortable and well-fitted mask can improve adaptation and adherence to PAP therapy. This study evaluated the usability and performance of a prototype tube-up nasal cradle mask (WSN) made of a textile material designed for enhanced comfort compared with users' own mask in a home-environment.
Methods: Adults who were on PAP therapy for OSA (≥ 6 months) (n = 120, female = 49) evaluated the WSN. Participant's subjective perceptions on several mask attributes was assessed using an 11-point Likert Scale at days 7, 30 and 90. Objective PAP therapy data were analysed and compared between the users' own and the prototype mask.
Results: The WSN mask received significant higher median ratings even after 90 days when compared with users' own mask in terms of ease of use (10 vs. 9), seal (9 vs. 8), comfort (9.5 vs. 8.5), feeling of material (10 vs. 9) and overall performance (10 vs. 9) ($p< 0.05$ for all comparisons). Participant's feedback on the textile is mostly positive, noting its softness and more pleasant texture. After 90 days of usage, the majority of patients (92.6%, 100/108) preferred the WSN for long term use. After 30 and 90 days, therapy data comparing WSN vs. own mask and WSN 30 vs.90 days performance indicated that PAP therapy remained effective based on device usage hours and the residual AHI. Objective leak data from the PAP machine is acceptable.
Conclusion: The results of this study showed that patients favored the WSN over their own mask. However, there is no difference in PAP usage with the WSN mask possibly because these patients had a very high compliance at the start of the study. Additional research with PAP users who have low compliance may be useful to determine if the WSN mask has an effect on adherence rate in this population.
Support (if any): ResMed Pty Ltd, ResMed Inc

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0582

EXPLORING A SUPPLEMENTAL MEASURE OF CPAP ADHERENCE

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Introduction: Obstructive sleep apnea (OSA) is highly prevalent in the Veteran population. The prevailing treatment for OSA is positive airway pressure (CPAP), but benefits depend on regular use. CPAP adherence is operationally defined as the number of hours of CPAP use per 24-hour period at the prescribed pressure. There are a variety of alternate metrics help to describe CPAP use, with most focused on duration and some type of categorization. Given the limited utility of these kinds of CPAP metrics, we wondered if a different type of CPAP adherence metric might be warranted. Putting on the CPAP mask is a behavioral action, so we explored the value of a metric focused on putting the mask on at least once per day.
Methods: Participants in an CPAP trial were provided standard education about their diagnosis and treatment at baseline. Follow-up visits were held two and four months from start of treatment. Treatment adherence metrics were derived from CPAP usage data. The "anyuse" metric was defined as the percentage of nights the mask was put on at least once in a 24-hour period.
Results: Twenty participants had a mean age of 50.2±13.9, mean AHI of 23.3±16.0, and mean BMI of 31.3.8±4.9 (kg/m2). Nightly CPAP adherence measured over the two-month period was 2.6±1.6 hours per night (mean±SD). The average anyuse at two-month was 78% ± 0.24 (12%-100%). Anyuse was moderately

correlated with CPAP adherence (r=0.682, r-squared=0.465, p< 0.001), which means that while 46% of the variance in adherence was accounted for by anyuse, 54% of the variance was not.
Conclusion: The anyuse metric is a relatively simple metric that might have value as a supplemental metric to CPAP adherence. Importantly, it does not overlap substantially with CPAP adherence and provides a measure of initial behavioral action. A possible related metric is a count of the number of mask on events per day. Further exploration of these metrics appears to be warranted.
Support (if any): This project was supported in part by the VA HSR&D IIR 16-277 and the VA San Diego Healthcare System Pulmonary Sleep Medicine Section and Research Service.

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0583

IMPROVEMENT IN SLEEP DEPTH ON CPAP IS RELATED TO ODDS-RATIO-PRODUCT (ORP) TYPE AND APNEA-HYPOPNEA-INDEX AT BASELINE

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Introduction: In split studies in academic sleep centers, CPAP improved NREM sleep depth, measured by the Odds-Ratio-Product (ORP, range 0 (deep sleep) to 2.5 (full-wakefulness), in only three (of 9) ORP types characterized by having < 10.2% of recording time with ORP< 0.5 (types 1,1, 1,2, and 1,3, with 1,3 additionally having excessive time (>12.5%) in full-wakefulness). Furthermore, ORPNREM did not improve on CPAP when AHI was < 30 hr-1 in any type except 1,3, where it improved marginally. In type 1,3, excessive time (>12.5%) in full wakefulness was only partially corrected with CPAP even at very high AHI, thereby suggesting an associated hyperarousal state. Here, we determined if the same applies during a full-night CPAP titration in a private practice setting.
Methods: We analyzed a cohort of 100 patients (Mage= 54.02±14.62) who underwent full-night diagnostic and full-night CPAP titration at a private sleep laboratory in Ontario, Canada. 77 patients had severe OSA (AHI 66.9hr-1, range 30-148 hr-1) and 23 had mild/moderate OSA (AHI 18.5, range 7.4-27.5 hr-1). In severe patients, there were 32 (41%) with little deep sleep and low/average full wakefulness (types 1,1 and 1,2), 39 (51%) with type 1,3, and 6 (8%) with other types. In the mild/moderate group 12 patients (52%) had type 1,3, and 11 (48%) shared the remaining 8 type.
Results: In severe patients ORPNREM decreased by 0.20±0.23, p< 0.0001 in types 1,1 and 1,2. In type 1,3, ORPNREM decreased by 0.26±0.29, p< 0.0001 (NS from 1,1 and 1,2) and time in full wakefulness and % awake also decreased by 6.82% and 9.80%, respectively (p's< 0.01). In patients with AHI < 30 there was no significant change in ORPNREM or % wake with any type, including type 1,3, where %awake remained at 37.2% on CPAP.
Conclusion: Similar to earlier findings from split studies, in this cohort about half of the patients had type 1,3, consistent with associated hyperarousal, regardless of OSA severity. Those with the same three types had improved sleep depth on CPAP. While those with 1,3 showed a reduction of full wakefulness with CPAP (from 26.1% to 19.3%), it remained elevated suggesting persisting hyperarousal.
Support (if any):

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0584

INFLUENCE OF COMORBIDITIES AND APNEA-HYPOPNEA INDEX ON CPAP COMPLIANCE IN PATIENTS WITH OBSTRUCTIVE SLEEP APNEA

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Introduction: Obstructive sleep apnea (OSA) is a prevalent disorder characterized by recurrent nocturnal breathing interruptions, often resulting in debilitating symptoms and a substantial cardiovascular burden. Continuous positive airway pressure (CPAP) remains the gold standard therapy for OSA, but its long-term effectiveness and the influence of comorbidities on treatment compliance require ongoing investigation.
Methods: In this retrospective study, we assessed the efficacy of CPAP therapy in a cohort of 201 OSA patients, using data collected from 2017 to 2023 in an outpatient sleep apnea clinic. The study population comprised 125 males and 76 females, with an average age of 66 years. The severity of OSA was categorized based on Apnea-Hypopnea Index (AHI) levels, and patients were prescribed CPAP therapy with tailored pressure levels. Compliance was evaluated by the percentage of nights with over 4 hours of CPAP usage, with results ≥70% considered compliant. The impact of comorbidities, including hypertension, diabetes mellitus, obesity, cardiac diseases and severe OSA, on treatment compliance was also assessed.
Results: Among the patients, 80.5% exhibited good compliance with CPAP therapy, while 19.5% demonstrated poor compliance. AHI values significantly improved, with the mean AHI at diagnosis 37.08 reducing to 3.41 at follow-up. Among patients with an AHI greater than 30, 90% exhibited good compliance, whereas those with an AHI less than 30 demonstrated good compliance in 69% of cases. Notably, the standard deviation of AHI values reduced from 29.01 to 4.35, underscoring a significant reduction in variability. Interestingly, patients with multiple comorbidities (61.6% of the patients) displayed a higher compliance rate compared to those with one or fewer comorbidities (17.9%).
Conclusion: This study reaffirms the enduring effectiveness of CPAP therapy as the gold standard for OSA treatment. High compliance rates with substantial reductions in AHI values support its continued use in managing patients with different comorbidities. Our findings indicate that increased compliance with CPAP is linked to the presence of multiple comorbidities and higher severity of AHI.
Support (if any): In future research, there is a need for concentrated research endeavors to formulate strategies aimed at improving compliance, particularly among patients with a lower number of comorbidities.

Abstract citation ID: zsae067.0585

0585

PAP THERAPY IMPACT ON BARIATRIC SURGERY COMPLICATIONS: A 30-DAY PRE-OPERATIVE EVALUATION

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Introduction: The coexistence of obstructive sleep apnea (OSA) and obesity creates an intricate clinical scenario, particularly for individuals pursuing bariatric surgery. OSA increases perioperative risks, including prolonged stay, re-intubation, and cardiovascular events. It is generally recommended that patients with OSA start using Positive Airway Pressure (PAP) therapy before surgery, however studies are mixed on whether use of PAP reduces postoperative or long-term complications, and many include only subjective compliance data. We examined objective pre-operative PAP use among OSA patients undergoing bariatric surgery and its impact in reducing post-operative complications.
Methods: Our study included data from 140 individuals who underwent bariatric surgery gathered over a 6-month period, with 79 having verified PAP use in the 30-days before surgery. A correlation analysis was conducted comparing 30-day pre-operative PAP use to total operative time, time in the Post-Anesthesia Care Unit (PACU), length of inpatient stay, collective PACU and inpatient time, ED visits within the 30 days post-op. There were no deaths, ICU transfers, respiratory or surgical complications in this sample. Furthermore, PAP use was categorized into tertiles, and an analysis of variances was completed for the following secondary variables: Apnea-Hypopnea Index (AHI), time with oxygen saturation < 88% and < 90%, age, and weight. Mean PAP use in minutes was 376±59 for the highest-use group, 183±61 for intermediate-use group, and 10±16 for lowest-use group.
Results: Our correlation analysis revealed no significant associations between 30-day pre-operative PAP use and above-mentioned outcomes. Upon PAP use stratification into tertiles, a statistically significant effect became apparent in relation to PACU time ($p = 0.008$), with oxygen saturation < 88% as a significant covariate. The PACU time in minutes varied across tertiles, with the highest-use group having a PACU time of 169±106, the intermediate-use group with 217± 156s, and the lowest-use group with 202±129.
Conclusion: Overall, complications rates after bariatric surgery were low. Increased PAP use was significantly associated with shorter stays in the PACU, perhaps related to faster time to recovery from anesthesia due to lower number of desaturations, hence mitigating need for continued nursing monitoring which could potentially lower healthcare associated cost.
Support (if any):

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0586

POSITIVE AIRWAY PRESSURE CHANGES IN PATIENTS WITH OBSTRUCTIVE SLEEP APNEA AFTER WEIGHT REDUCTION SURGERY

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Introduction: Obesity is a modifiable risk factor for obstructive sleep apnea (OSA). Weight management interventions have been shown to reduce OSA symptoms and severity for some patients. This retrospective analysis aimed to evaluate the impact of weight reduction surgery or procedure (WRS/P) on pressure changes in positive airway pressure (PAP) treated patients as a proxy for changes in OSA severity following surgery.
Methods: We analyzed administrative claims data from 2015 to 2021 of adult (≥18 years) OSA patients linked to PAP device data. The date on which the first ICD-10/9 or CPT code appeared for a WRS/P was the index date. Inclusion criteria were a categorical body mass index (BMI) ≥30 kg/m2 at baseline, at least 1 year of insurance coverage pre-index, and a minimum of 1 year of PAP therapy data post-index. Changes in PAP pressure were assessed as the difference between median PAP pressure 1 month pre-index and the most recent pressure post-index date. Only categorical BMI is coded in claims, so changes in BMI category following WRS/P were assessed using the difference between categorical midpoints.
Results: A total of 17,284 OSA patients underwent WRS/P (mean age 45.6 years; 74.7% female). Patients were categorized based on their pre WRS/P BMI (≥30 - < 35, ≥35 - < 40, ≥40 - < 45, ≥45 - < 50, ≥50 - < 60, and ≥60 kg/m2). The average baseline apnea-hypopnea index (AHI) was 16.9, 18.2, 19.9, 23.4, 25.1, and 27.0 events/h respectively. After WRS/P the average decrease in BMI was 3.3, 5.7, 6.8, 8.1, 10.3, and 13.0 kg/m2; and the average decrease in the median PAP pressure was 0.8, 0.9, 1.0, 1.3, 1.3, and 1.3 cm H2O respectively.
Conclusion: Patients with the highest baseline BMIs experienced the most weight loss after WRS/P. These individuals also had the greatest reductions in PAP pressures following surgery. Using PAP pressure as a proxy for OSA severity, in absence of post-surgery sleep testing, our findings suggest that patients with higher baseline BMIs are likely to achieve the most substantial, albeit not complete, reductions in OSA severity, compared to those with lower baseline BMI, after undergoing WRS/P.
Support (if any): ResMed

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0587

ADHERENCE AND QUALITY OF LIFE OF PATIENTS WITH SLEEP DISORDERED BREATHING TREATED WITH AUTOMATIC SERVO-VENTILATION

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Introduction: Automatic servo-ventilation (Auto SV) treats Central sleep apnea (CSA) and obstructive sleep apnea (OSA) by monitoring airflow and intervening with changes or pauses in airflow patterns. Evidence on adherence to Auto SV therapy and its effects on symptoms, sleep quality and quality of life (QOL) in real world Auto SV users is sparse. The aim of this registry study was to describe the adherence to Auto SV (Philips DreamStation BiPAP auto SV) and to evaluate Auto SV therapy effects on sleepiness, sleep quality and QOL.
Methods: Data were collected at six sites across Germany from 2018 through 2023 at 6, 12, and/or 24 months. Auto SV adherence data were collected through Philips EncoreAnywhere™ (EA) software and examined according to intent-to-treat and subgroup analyses accounting for data gaps. Average adherence was calculated from the first to the final date of first device usage. Sleepiness, sleep quality and general QOL were assessed with the Epworth Sleep Scale (ESS), the Pittsburgh Sleep Quality Index (PSQI) and the European Quality of Life-5 level questionnaire (EQ 5D-5L), respectively. Changes from baseline (CFB) were calculated for questionnaires collected at enrollment and at

visits at 6, 12 and 24 months (Mixed-Models including Sidak adjustment).
Results: One hundred and twenty-five participants were enrolled. Average age was 65 ± 12 years; 106 (85%) were males. Average adherence over days used was 6.0 ± 1.9 hours/day (n = 103) and 5.0 ± 2.4 hours/day (n = 103) among all days (average follow-up 478 days). Percent days used averaged 78.5 ± 27.1%. ESS and global PSQI scores showed significant improvement from baseline at 24 months in completed-cases and last-observation-carried-forward analyses (ESS [Mean difference: CC -1.9 ± 3.9 (N=57), LOCF -1.8 ± 4.5 (N=103), p ≤0.001], PSQI [Mean difference: CC -1.7± 3.5, LOCF (N=55), -1.6 ± 3.5 (N=98), p < 0.001]). The EQ-5D-5L did not significantly differ from baseline.
Conclusion: Auto SV use averaged 5 hours per night and Auto SV significantly improved sleepiness and sleep quality, but not general QOL, in a real-world sleep clinic population. ESS approached clinical significance (MCID 2.0) while the PSQI did not (MCID 3).
Support (if any):

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0588

COMBINATION THERAPY: HYPOGLOSSAL NERVE STIMULATION AND ORAL APPLIANCE THERAPY

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Introduction: Hypoglossal nerve stimulation (HGNS) is an implantable body that protrudes the tongue anteriorly during sleep. This surgical procedure is effective with minimal side effects, however for some patients 80 complications arise and require additional treatment modalities. One such alternative is oral appliance therapy that uses a different mechanism of action to displace the mandible anteriorly which is worn on the upper and lower teeth.
Methods: Five patient charts were identified out of 80 that had undergone hypoglossal nerve stimulation surgery with subsequent placement of oral appliance. Patient characteristics were identified to understand clinical reasoning leading to combination therapy and success of treatment.
Results: The most common reasons for a referral to the dentist after surgical placement of hypoglossal nerve stimulator is due to abrasion of the tongue (60%) and residual snoring (60%) with some patients having multiple reasons for the referral. Oral appliances were made for 4 of the 5 patients. Of the 4 patients all have evidence of tooth wear with 50% of patients having minor chipping on a front tooth. Average pre-treatment AHI was 33±13 to average post-treatment for combination therapy (HGNS with oral appliance) AHI of 6±2. Combination treatment eliminated both residual snoring and abrasion of the tongue in all patients.
Conclusion: The limitations are that there was a small sample size since a referral after HGNS surgery to oral appliance is rare. While conclusions about the patient characteristics cannot be generalized to the general population due to the small sample size, it was found that all patients had evidence of tooth wear which is common in the obstructive sleep apnea population. Clinically, combination therapy of HGNS and oral appliance therapy can be a viable alternative for some patients.
Support (if any): None.

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0589

EVALUATING THE IMPACT OF SLEEP POSITION ON EFFICACY OF HYPOGLOSSAL NERVE STIMULATION

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Introduction: Current literature supports hypoglossal nerve stimulation (HNS) as a treatment option for select patients with moderate-to-severe obstructive sleep apnea (OSA). However, in about a third of implanted patients, HNS is ineffective. To date, few publications have investigated how sleep position impacts HNS efficacy. In 2019, the Stanford group found that HNS had a greater impact on non-supine AHI vs supine AHI; the data was limited to eleven patients monitored in the sleep lab and did not incorporate full-night data. We explored the effect of sleep position on HNS efficacy in a larger sample by comparing pre- and post-operative overnight sleep studies.
Methods: We performed a retrospective chart review of 136 patients implanted at Mount Sinai Hospital from 2016-2023. Patients were included if they tolerated therapeutic voltage and completed pre- and post-operative sleep studies with at least 30 minutes of supine and non-supine sleep. Mean differences in pre- and post-operative overall AHI4% (DeltaAHI), supine AHI4% (DeltaSupine) and non-supine AHI4% (DeltaNon-supine) were calculated. Paired T-Test was then performed to compare AHI4% percent reduction when supine versus non-supine. Secondary outcomes included mean difference in pre- and post-operative ODI4 (DeltaODI) and ESS (DeltaESS). We also calculated our cohort's surgical success rate, as defined by Sher's criteria.
Results: Seventeen patients met inclusion criteria. Mean age was 60.2+/-11.2 years, and 15 patients were male (88.2%). Mean BMI was 29.1+/-3.0 kg/m2. Mean preoperative AHI4% was 29.4+/-14.8 events/hour; mean preoperative supine AHI4% and non-supine AHI4% were 44.6 events/hour and 13.3 events/hour respectively. Overall DeltaAHI was 15.2 events/hour (p=0.0004), DeltaSupine was 21.4 events/hour (p=0.0071), and DeltaNon-supine was 6.2 events/hour (p=0.0486). Despite the difference in absolute reduction, there was no statistically significant difference (p=0.3242) between the percent reduction of supine AHI4% (41.7%) versus non-supine AHI4% (10.0%). Mean differences for DeltaODI and DeltaESS were 11.5 (p=0.0051) and 2.9 (p=0.2) respectively. Overall success rate was 58.8% (10 of 17 patients), which is similar to other studies in the literature.
Conclusion: In our sample, we found no difference in AHI percent reduction between supine and non-supine position, suggesting that HNS is effective in improving OSA regardless of positionality.
Support (if any): NCATS: TL1TR004420;

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0590

HYPOGLOSSAL NERVE STIMULATION FOR OSA – A SYSTEMATIC REVIEW OF ADVERSE EVENTS IN CLINICAL TRIALS & REAL-WORLD-DATA

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Introduction: Hypoglossal Nerve Stimulation (HNS) has been recognized as a novel therapeutic approach for individuals suffering from Obstructive Sleep Apnea (OSA). Extensive clinical trials and accumulated real-world data have consistently demonstrated that HNS offers significant, enduring enhancements in managing OSA symptoms and improving overall quality of life for patients. Given the nature of HNS treatment, with the requirement of using an implantable neurostimulation system, patient safety is a critical domain in the assessment of this technology. The objective of this review was to evaluate adverse events (AE) and complications with HNS therapy in a systematic review of published evidence.
Methods: MEDLINE, Cochrane, and Web of Science were systematically searched to identify randomized controlled and real-world observational studies reporting relevant outcomes with HNS therapy for treatment of OSA, which included procedure-, device- and treatment-related AE. Risk of bias assessment was conducted using the ROBINS-I tool.
Results: Out of 499 articles screened, 27 were reviewed for eligibility, and seventeen studies, the majority found having low to moderate risk of bias, and totaling data of 2,095 patients were included for further analysis. Across included studies, reporting of AE was heterogenous with regards to used classifications as well as extent of reporting. Over an average follow-up duration of 17.5 ± 16.9 months, the pooled mortality rate was 0.01% (95% CI = 0.0 to 0.2%), with all reported deaths being unrelated to HNS treatment. The pooled HNS device explant rate was 0.03% (95% CI = 1.0 to 2.1%), with infections and request for removal by patient being the most common indications. The pooled surgical revision rate was 0.08% (95% CI 0.0 to 0.2%). Most reported treatment-related side-effects were transient stimulation-related discomfort (0.08%, 95% CI = 0.0 to 0.2%) and tongue-abrasions (0.07%, 95% CI = 0.0 to 0.2%).
Conclusion: In this systematic review, HNS therapy for treatment of OSA is associated with a positive patient safety profile. AE occur mainly at device implantation and during the treatment acclimatization period. Significant heterogeneity was found for adverse event reporting. Implementation of a harmonized framework for reporting HNS outcomes that includes AE and side-effects is warranted to ensure comparability of results.
Support (if any):

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0591

IMPROVING EFFICIENCY & PATIENT OUTCOMES USING LONGITUDINAL MONITORING VIA A HSAT WITH HYPOGLOSSAL NERVE STIMULATION

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Introduction: Hypoglossal Nerve Stimulation (HGNS) is an increasingly prevalent treatment for moderate-severe obstructive sleep apnea (OSA). HGNS therapy requires titration to identify the optimal stimulation parameters for patient comfort and OSA improvement. The recommended post-activation care protocol is long, typically taking 90-120 days to complete. The purpose of this study was to evaluate an optimized protocol utilizing a home sleep apnea test (HSAT) capable of long-term longitudinal monitoring to frequently assess treatment efficacy as stimulation amplitude adjustments were being made.
Methods: The study included 30 adults undergoing titration of an HGNS implant at a Sleep Clinic in Arizona, USA from January-October 2023. The revised protocol: The device was activated 3-weeks post-op and the stimulation amplitude was increased by 0.1V every 4 days following device activation. Patients were advised to test their sleep with a HSAT for 1 night on the 2nd night after every amplitude increase to minimize the risk of "1st night effect" after the initial amplitude increase. Follow-up visits were scheduled every 2 weeks post-activation, where the HSAT data was reviewed. Apnea/Hypopnea Index (AHI) and SPO2 were used to evaluate OSA severity. An in-lab titrations study was conducted 10-12 weeks post-activation if the patient was asymptomatic and adherent, and the HSAT showed significant improvement in OSA parameters.
Results: The updated care protocol took an average of 63.76 (SD 41.14) days from activation to completion 86.6% (n=26) of patients completed the program in < 90 days and 60% (n=18) completed the program in ≤60 days. The mean percent reduction in AHI was 68.09% (SD 21.89; mean -15.21 AHI). The mean increase in minimum SPO2 was 4.31% (SD 5.11).
Conclusion: A new HGNS titration protocol that included frequent testing with a HSAT allowed for objective, longitudinal assessment of the effectiveness of each amplitude/output adjustment. Monitoring OSA parameters minimized over-titration of the device amplitude, improving patient comfort, and allowed for earlier identification of the need to try a different electrode configuration if the AHI was not improving. This study demonstrated that a shorter program length was possible while still maintaining good treatment efficacy.
Support (if any): Employees of Wesper contributed to the data analysis.

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0592

ACCELEROMETER CONTROL PERFORMS COMPARABLE TO PRESSURE SENSOR CONTROL OF HYPOGLOSSAL NERVE STIMULATION TIMING

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Introduction: The hypoglossal nerve stimulation (HNS) system from Inspire Medical Systems, Inc (Golden Valley, MN) monitors respiration with a pressure sensor to deliver stimulation during inspiration. The sensor is embedded in a lead that is typically implanted in the second intercostal space and anterior to the generator. Inspiratory phase overlap fraction (IPOF) is the fraction of the inspiration phase concurrent with the stimulation burst. An accelerometer embedded in the generator to replace the implanted sensor lead could simplify the

HNS system and implant procedure. To test whether an accelerometer control system performs comparably to the pressure sensor control system, we compared the IPOF of the commercial HNS system to that derived from an externally mounted accelerometer.
Methods: Fifty-six patients previously implanted with an HNS system (8 Inspire II, 48 Inspire IV) underwent a polysomnogram (PSG) while also wearing two accelerometers on their chest (approximately 5 cm below each the left and right clavicle, a typical implant location). The commercial system stimulation timing was exported and time-aligned with the PSG waveform to calculate the commercial system's IPOF. The accelerometer waveforms were exported and time-aligned with the PSG respiration sensor, then the sensing algorithm was applied to the accelerometer waveforms to determine stimulation timing and calculate the accelerometer system's IPOF. IPOF is reported as mean ± standard deviation [95% confidence interval for the mean]. The entire cohort was used in commercial system analysis but was divided into separate groups for accelerometer algorithm tuning and validation.
Results: Commercial system IPOF was 78%±7%, 95%CI [76%-79%] (n=56, 298 sleep hours). Accelerometer system IPOF was 86%±6%, 95%CI [84%-88%] in the tuning group (n=26, 133 sleep hours) and 83%±8%, 95%CI [80%-85%] in the validation group (n=30, 165 sleep hours).
Conclusion: Results from this study demonstrate an externally worn accelerometer based IPOF is comparable to the pressure sensor based IPOF of the implanted HNS system. This suggests an accelerometer control system embedded in the generator could replace the implanted pressure sensor to provide at least equivalent stimulation delivery.
Support (if any): This study was funded by Inspire Medical Systems. Inspire employees contributed to the study execution and data analysis.

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0593

INSPIRE DEVICE THERAPY: A TREATMENT OPTION FOR OBSTRUCTIVE SLEEP APNEA POST ORTHOTOPIC HEART TRANSPLANT

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Introduction: Continuous Positive Airway pressure (CPAP) therapy is currently the standard of care for patients with obstructive sleep apnea (OSA). Commonly seen in patients with heart failure, this condition can persist post Orthotopic Heart Transplant (OHT). PAP therapy is frequently not tolerated, yet untreated OSA can potentiate graft failure. The FDA approved INSPIRE device provides hypoglossal nerve stimulation as optional therapy for OSA. However, there is a paucity of data for its utility and efficacy in the post cardiac transplant patients. The heart transplant graft is denervated and it is thus uncertain if treatment would be similarly effective as in patients without OHT. We therefore report our experience in the use of the INSPIRE device following OHT.
Methods: Chart review was performed for this case report using Epic electronic health record
Results: TB is a 72 yr old man status post OHT in 2015. He has known OSA since 2016 for which he was placed on CPAP. He was intolerant to CPAP after OHT. He was therefore referred to ENT for consideration of Inspire device. He underwent uneventful surgical implantation of device in December 2022. He was subsequently followed in the sleep clinic and INSPIRE device settings optimized. He reported improved sleep quality, increased daytime energy and is clinically doing well 10 months after implant. The central apnea index was zero and there were no Cheyne stoke respirations pre and post-implant.
Conclusion: The INSPIRE device is effective and safe following Orthotopic Heart Transplant (OHT). The benefit is seen early and appears to be well tolerated following implant with low procedural complication.
Support (if any):

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0594

NOVEL DEVICE TO SIMULATE HYPOGLOSSAL NERVE STIMULATION RESPONSE TO PREDICT SURGICAL SUCCESS

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Introduction: Hypoglossal Nerve Stimulation (HGNS) is a surgical procedure to treat obstructive sleep apnea (OSA). The procedure involves placing an electrical cuff around the hypoglossal nerve to electrically stimulate the nerve during inspiration to anteriorly position the tongue thus treating the obstructive event. Currently, a drug induced sleep endoscopy is completed prior to the HGNS surgery to investigate if implantation would be predictably successful. Yet, treatment failures continue to exist despite current VOTE classifications, concentric collapse identification, and other methods used to improve patient selection for HGNS implantation.
Methods: A pilot study was conducted to investigate the potential of a non-invasive hypoglossal nerve stimulator to evaluate the potential of predicting surgical success during DISE. The non-invasive stimulator activates the hypoglossal nerve without direct contact with the nerve and therefore does not require surgery. Ten adult patients (≥ 18 years of age) presenting at Michael E. DeBakey Department of Veterans Affairs Medical Center with moderate to severe OSA (15-60 AHI) and BMI less than 40 that were undergoing DISE procedure participated. The stimulator device was used during the DISE procedure to identify reduction of collapse during hypoglossal stimulation prior to implantation. Endoscopy videos were collected during standard procedure and during use of the stimulation device and shown to three blinded board-certified sleep physicians to score likelihood of success with HGNS implant based on absence of concentric collapse identification, presence of anterior-posterior collapse using the VOTE classification, and stimulation device method.
Results: Patients will be followed to identify percentage AHI reduction, patient reported tolerance of implanted HGNS, and provider reported overall success of implanted HGNS.

Conclusion: The novel non-invasive HGNS device has the potential to improve prediction of implantation AHI reduction success and understand likelihood of tolerance.
Support (if any): Ember Sleep provided the stimulation device at no cost.

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0595

TOLERABILITY AND ACTIVATION PARAMETERS BETWEEN EARLY VS ROUTINE ACTIVATION OF HYPOGLOSSAL NERVE STIMULATION THERAPY

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Introduction: The current management protocol for HGNS is derived from the efficacy trials, but there is a lack of published data evaluating the tolerance and safety of earlier activation protocols. Thus, our goal is to compare the early and conventional activation parameters to identify differences. This will help us determine the potential benefits and risks associated with earlier activation and inform future protocols for HGNS management.
Methods: A retrospective cross-sectional study was conducted using data from a sleep specialty clinic of patients who received HGNS implantation for OSA. The patients were divided into two groups: early activation and standard activation. Data collected included age, time from implantation to activation, sensory threshold, and functional threshold. Statistical analysis involved the use of a non-parametric Wilcoxon rank-sum test for continuous variables and Fisher's exact test for categorical variables to identify any significant differences between the two groups.
Results: A study was conducted on 58 patients, with 31 in the early activation group and 27 in the standard activation group. Among the early activation group,35% were female and 65% were male, while the standard activation group had 48% female and 52% male patients. Gender distribution was not significantly different between the two groups (P 0.425). The mean age was66 in the early activation group and 63 in the standard activation group, with no significant difference (P 0.67). The mean days until activation was significantly shorter in the early activation group (22.5 days, 95% CI 23.5-32.4) than in the standard activation group (45.1 days, 95% CI 32.3-47.9) (P0.00). The sensory threshold was significantly lower in the early activation group (mean 0.4, 95% CI 0.35-0.55) compared to the standard activation group (mean 0.7, 95% CI 0.59-0.88) (P 0.002). However, no significant difference in the functional threshold was observed, with mean values of 0.8(95% CI, 0.65-0.94) and 1.0 (95% CI, 0.85-1.27) for the early and standard activation groups, respectively (P 0.07).
Conclusion: Although patients who were activated early seem to have a lower sensory threshold, early activation did not appear to affect their functional threshold or activation standards.
Support (if any):

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0596

COMPARATIVE ANALYSIS OF CONTINUOUS POSITIVE AIRWAY PRESSURE AND HYPOGLOSSAL NERVE STIMULATION

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Introduction: Continuous positive airway pressure (CPAP) adherence represents a pervasive, multifactorial challenge. Hypoglossal nerve stimulation (HNS) is an alternative treatment for moderate-severe obstructive sleep apnea (OSA) for those who are CPAP-intolerant. We hypothesized differential predictors of therapy adherence and greater adherence with HNS versus CPAP.
Methods: We compared adherence and its predictors in patients from the Cleveland Clinic HNS registry (cloud-based data monitoring) versus those on CPAP from the HomePAP study at the 1st and 3rd month timepoints. Linear models assessed age, sex and body mass index (BMI) as 1- and 3-month HNS and CPAP adherence predictors. Propensity score matching (1:1) without replacement and t–tests were used to compare adherence across the groups. Propensity scores were estimated with support vector machine using age, sex, BMI and Epworth Sleepiness Scale (ESS) at baseline.
Results: We analyzed data from n=63 HNS patients (age:57.9±10.0 years, 60% male, body mass index (BMI):28.8 ±3.3 kg/m2), ESS score:8.83±4.69) and n=126 CPAP patients from the HomePAP study (age:49.8±11.9 years, 63% male, BMI:39.1±9.43 kg/m2, ESS score:14.3±3.8). At 1-month, female sex was associated with increased HNS therapy usage (1.20, SE:0.47, p< 0.01); a finding not observed at 3-months. Propensity score-matched analysis included 28 HNS patients (age: 53.6± 9.9 years, 67% male, BMI:30.7± 2.6 kg/m2, ESS:11.4± 3.7) and 28 CPAP patients (age:58.5± 9.6 years, 85% male, BMI:31.2± 4.0 kg/m2, ESS:12.2± 3.6). At 1-month (HNS n=28, CPAP n=27), usage was 3.90±1.0 hours for CPAP and 6.97±1.09 hours for HNS (p< 0.01). At 3-months (HNS N=27, CPAP N=24), usage was 4.38±1.87 (SD) hours for CPAP and 6.44±1.96 hours for HNS (p< 0.01).
Conclusion: In this comparative analysis, we identify female sex as a factor associated with early adherence to HNS, findings not observed with CPAP. Using a rigorous approach to address baseline differences, we identify a substantial increased level of adherence in HNS versus CPAP therapy of approximately 2-3 hours which persisted until 3 months. Future investigation should focus on assessing HNS versus CPAP adherence-related improvement in clinical outcomes.
Support (if any): NIH grant R21HL170206.

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0597

HYPOGLOSSAL NERVE STIMULATION ADHERENCE INCREASING YEARLY

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Introduction: Hypoglossal nerve stimulation (HGNS) for obstructive sleep apnea is a surgically implanted device that the patient starts with a button press on a short-range telemetry remote. The therapy ends after a programmable time period (default 8 hours) or the patient manually stops the therapy with another button press. Patients newly implanted with Inspire devices have been observed to use their therapy more than patients implanted in the past. To test the effect of time on adherence, we analyzed newly activated HGNS patients' usage data year by year.
Methods: De-identified data was collected via the manufacturer's patient management system (SleepSync, Inspire medical systems). 8532 patients activated from 2018 through 2022 were selected. HGNS adherence was measured as total hours of therapy used per night via remote device uploads. Adherence during the patients' first year was compared by year of device activation, using one-way analysis of variance (ANOVA) and Tukey's test for multiple comparisons. Usage by activation year is reported as mean ± standard.
Results: In all patients, the mean pre-implant AHI and ESS were 34.3±15.2 and 9.4±4.9 respectively. Mean BMI and Age were 28.9±3.5 and 61.8±11.3 respectively. 2018 usage: 5.3±1.7 hrs, n=396. 2019 usage: 5.4±1.6 hrs, n=851. 2020 usage: 5.5±1.7 hrs, n=1426. 2021 usage: 5.5±1.6 hrs, n=2876. 2022 usage: 5.6±1.7 hrs, n=2983. ANOVA showed usage differed between at least two years ($F=5.7$, $p< 0.001$). Tukey analysis showed the mean patient adherence was significantly different between years 2018 and 2022 (95% CI=[-0.58, -0.08]), between 2019 and 2022 (95% CI=[-0.42, -0.06]), and between 2021 and 2022 (95% CI=[-0.27, -0.02]).
Conclusion: First-year HGNS adherence has increased over time, from 5.3 mean hours in 2018 to 5.6 mean hours in 2022. Iterative improvements in the Inspire Care Pathway over this time frame may have contributed to increased usage. Increasing device utilization is important especially in HGNS patients given their pre-baseline severities are in the moderate to severe range and increased utilization of therapy can lead to significant reductions in mean disease burden.
Support (if any): Employees of Inspire Medical Systems contributed to the data analysis.

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0598

HYPOGLOSSAL NERVE STIMULATION: DOES THE RATIO OF APNEAS TO HYPOPNEAS MATTER WHEN IT COMES TO SUCCESSFUL OUTCOMES?

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Introduction: While hypoglossal nerve stimulation (HNS) is a safe and effective treatment for moderate to severe obstructive sleep apnea (OSA) HNS is not effective in some patients despite optimal titration. This study investigates whether apnea-predominant OSA versus hypopnea-predominant OSA during pre-operative sleep study can be used to predict successful outcomes after HNS implantation.
Methods: This is a single-center retrospective study of consecutive patients with moderate to severe OSA who underwent implantation of HNS at an academic medical center. Apnea-predominant and hypopnea-predominant were determined by comparing the proportion of obstructive apnea and hypopnea events in pre-operative polysomnography or home sleep apnea testing if polysomnography was not conducted. Post-implantation apnea/hypopnea index (AHI) was derived from polysomnography performed 3 months or later after device activation in all subjects. The Mann-Whitney nonparametric test was used to compare the distribution of AHI reduction between apnea-predominant and hypopnea-predominant cohorts.
Results: Eighty-two patients treated with HNS implanted between December 2021 and July 2023 were evaluated. Sixty-two (75.6%) patients were male, with a median age of 65.5 (55.3-71) years and a median pre-implantation Body Mass Index (BMI) of 29.4 (27.5-31.5) kg/m2. Median pre-implantation AHI was 28.8 (18.5-45.9) events/hour. Before HNS implantation, 45 patients had hypopnea-predominant AHI with a median apnea-to hypopnea ratio of 0.33 (0.14-0.60) and 37 patients had apnea predominant AHI with median apnea-to-hypopnea ratio of 2.23 (1.35-4.37). There was no significant difference between the two cohorts in age or BMI. The pre-implantation AHI was higher in the apnea-predominant cohort (36 (21.2-49.6) events/hour) compared to the hypopnea-predominant cohort (23.7 (18-37) events/hour). Median AHI reduction in the hypopnea-predominant cohort was 78.3% (51.2-90.2%). Median AHI reduction in the apnea-predominant cohort was 72.3% (35.5-85.4%). There was no significant difference in the distribution of AHI reduction between the two groups after HNS (p=0.40).
Conclusion: There was no statistically significant difference between pre-implantation OSA which was apnea-predominant versus hypopnea-predominant in the degree of AHI reduction with HNS therapy. However, this study may be limited on the basis of comparing pre-implantation AHI as obtained on a home sleep study, as compared to post implantation AHI obtained on a diagnostic polysomnogram.
Support (if any): none

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0599

EFFECTS OF PROXIMAL HGN STIMULATION IN HTN SUBJECTS WITH MODERATE TO SEVERE OSA: A 5-YEAR ANALYSIS OF THE THN3 RCT

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Introduction: Hypoglossal nerve stimulation (HGNS) improves sleep-disordered breathing (SDB), oxygenation, and quality of life (QOL) in obstructive sleep apnea (OSA), but to date, has not been shown to improve cardiovascular outcomes. The THN3 randomized, controlled trial of proximal HGNS included subjects with office systolic blood pressure (SBP) ≤160mmHg or diastolic pressure ≤100mmHg. In post-hoc analyses, we examined whether antihypertensive effects of HGNS could be identified in a hypertensive THN3 subgroup.
Methods: THN3 participants (AHI 20-65/hr; BMI ≤ 35 kg/m2, no drug-induced sleep endoscopy screening) were followed for 5 years after HGNS system implant. In addition to annual measurements of SDB and QOL, BP was measured at every visit. Normotensive and hypertensive subgroups were fit to a linear mixed model with quadratic terms and 2 latent classes in order to estimate group BP trajectories from the time of HGNS initiation. Differences in baseline characteristics between classes were also evaluated.
Results: Of 137 subjects with evaluable data, 130 (95%) belonged to a normotensive class. SBP remained stable in this group, with estimated SBP mean (95%CI) of 128.9 (127.2,130.6), 129.2 (127.7,130.8), 129.5 (127.7,131.3), 129.7 (127.8,131.6), 129.8 (127.9,131.8), and 129.9 (127.3,132.5) mmHg at Baseline followed by Years 1-5 measurements, respectively. The remaining 7 (5%) subjects belonged to a hypertensive class. SBP decreased over time in these hypertensive patients with HGNS, with the estimated SBP mean trajectory of 156.4 (145.5,167.3), 142.8 (133.8,151.8), 134.8 (125.5,144.2), 132.5 (123.2,141.7), 135.7 (126.5,144.9), and 144.5 (132.2,156.9) mmHg. Aside from SBP, the groups differed at Baseline in average oxygen desaturation index (37.5±10.1 vs. 32.6±3.3/hr, normotensive vs. hypertensive) and percentage of sleep time with oxygen saturation < 90% (11.9±9.8 vs. 4.7±3.8%). No meaningful differences were detected in Baseline age, sex or BMI.
Conclusion: Amelioration of OSA and nocturnal hypoxemia with proximal HGNS may improve SBP in hypertensives with moderate to severe OSA. If so, HGNS may improve long-term cardiovascular outcomes. Future analyses in the ongoing OSPREY and other trials should determine whether HGNS predicts reductions in SBP.
Support (if any): LivaNova

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0600

BASELINE DECISIONAL CONFLICT AND 3-MONTH DECISION REGRET AMONG PATIENTS CONSIDERING SLEEP SURGERY

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Introduction: Sleep surgery has a role as secondary or adjunctive treatment of obstructive sleep apnea (OSA) after unsuccessful trial of CPAP therapy. In the shared decision-making process, patients are informed of the potential benefits, expected course, and potential risks of surgery. We believe that the careful consideration of these competing issues can increase decisional conflict initially but reduce decision regret subsequently. We hypothesized that patients considering sleep surgery who have higher baseline decisional conflict will have lower 3-month decision regret after making a choice, whether or not they proceed with surgery.
Methods: This prospective cohort study enrolled consecutive adult patients considering sleep surgery for OSA after difficulty with CPAP therapy. After surgery consultation, patients completed the validated Decisional Conflict Scale (16 items, score range 0-100, higher worse, >20 clinically important). At 3-months after surgery (surgery group) or 3-months after the consultation (control group), patients completed the validated Decision Regret Scale (5 items, score range 0-100, higher worse). Records were extracted for other variables. Linear regression analyses tested the associations between baseline Decisional Conflict and 3-month Decision Regret after adjusting for age, sex, race, Functional Comorbidity Index, type of sleep surgery, and history of sleep surgery.
Results: The cohort (N=157) characteristics include mean age 41+/-13 years, 60% males, and apnea-hypopnea index 26+/-22. For the whole cohort, baseline Decisional Conflict was 20+/-17 (borderline conflict), 3-month Decision Regret was 19+/-20 (mild regret), and there was no association between the two variables (adjusted R2=0.001, p=0.2). The surgery group had lower baseline Decisional Conflict and lower 3-month Decision Regret compared to the control group, but there was no association between baseline Decisional Conflict and 3-month Decision Regret in either group (R2=0.01 and 0.02).
Conclusion: Baseline decisional conflict was not associated with 3-month decision regret, whether or not surgery was chosen. The lack of association may be due to the low baseline decisional conflict, low 3-month decision regret, or other factors impacting decisional conflict (eg, choice predisposition, prior knowledge, risk aversiveness) or decision regret (eg, clinical outcome, adverse effects). Future work includes testing predictors of baseline decisional conflict and subsequent decision regret independently.
Support (if any): American Academy of Otolaryngology Resident Research Award

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0601

HISPANIC ETHNICITY IS ASSOCIATED WITH DECREASED ADHERENCE TO HYPOGLOSSAL NERVE STIMULATION

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Introduction: Hypoglossal nerve stimulation (HGNS) is an alternative therapy for patients with obstructive sleep apnea intolerant to positive airway pressure (PAP). Psychosocial variables proven to influence PAP adherence, such as race, ethnicity, and baseline insomnia, have not been well studied with HGNS. This study evaluates HGNS use based on ethnicity and baseline comorbid insomnia (COMISA).
Methods: We conducted a retrospective analysis of patients implanted with HGNS at the University of Miami and Miami VA sleep centers (2017-2023) who were seen for initial follow-up within one year post-implantation. Patient demographics, baseline sleep characteristics, comorbidities, and polysomnography variables were extracted from the electronic medical record. Comorbid insomnia was defined by sleep onset latency or wake after onset time > 30 mins. Comparisons between Hispanic and non-Hispanic patient characteristics were performed with Chi-square or Student t-tests, as appropriate. Objective HGNS adherence data and stimulation parameters were extracted from the Inspire cloud or tablet monitoring system at the most recent visit. Adjusted linear regression models were constructed to determine if COMISA and Hispanic ethnicity were associated with mean nightly HGNS use. Analyses were adjusted for age, gender, sleepiness, AHI, and time to follow-up.
Results: The cohort included 68 patients (18% female, 97% White, 53% Hispanic, 38% US Veterans) with mean age of 62 +/- 11 years, mean body mass index of 29 +/- 3 kg/m2, and baseline apnea hypopnea index of 37 +/- 19 events/hour. Mean duration since implantation was 35 +/- 30 months and mean HGNS use was 274 +/- 147 min/night. In unadjusted comparisons there were no differences in demographics, sleep characteristics, treatment parameters, time since implantation, or follow-up between Hispanics and non-Hispanics. In adjusted analyses, Hispanic ethnicity was associated with 81.7 (p=0.035) fewer minutes of nightly HGNS use compared to non-Hispanic individuals. COMISA was not significantly associated with HGNS adherence.
Conclusion: Ethnicity influences HGNS adherence, while COMISA does not significantly affect usage. Hispanic patients used HGNS more than one hour less per night compared to non-Hispanic individuals. Further evaluation of potential contributing factors, such as socioeconomic status and referral biases, is warranted.
Support (if any):

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0602

APPLICATION OF A PHYSIOLOGY BASED OSA ENDOTYPE MODEL TO PREDICT ORAL APPLIANCE OUTCOMES USING HOME SLEEP STUDY DATA

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Introduction: Prediction of oral appliance therapy (OAT) response to treat obstructive sleep apnea (OSA) remains a major clinical challenge (currently ~50% or less depending on treatment definition). Recent physiology-based studies indicate that different combinations of pathophysiological traits or "OSA endotypes" are associated with OAT outcomes. However, methodologies to identify OSA endotypes to inform patient selection for OAT have largely been limited to in-laboratory and detailed physiology testing which limits clinical translation potential. Accordingly, we recently developed a physiology-based model that uses standard polysomnography and clinical data to predict OAT outcomes with correct OAT treatment classification in ~60 to >90% of cases depending on the treatment outcome definition (Dutta et al, J Clin Sleep Med, 2022). Here we applied this model to a large clinical cohort who had a home-based diagnostic study to determine the proportion of people estimated to respond to OAT.
Methods: Model based OAT predictions were performed using clinical data (i.e., age and BMI) plus standard sleep study outputs from >6,500 consecutive home-based diagnostic studies (Sleep Profiler PSG- Advanced Brain Monitoring). All participants had an apnea/hypopnea index (AHI) >5 events/h. The proportion of participants who were estimated to respond to OAT according to the model was calculated across three commonly used treatment outcome definitions: 1) AHI< 5, 2) AHI< 10 events/h and 3) 50% reduction in AHI.
Results: On average, participants (39% female) were middle-aged (49±15 years ([Mean±SD]), had moderately severe OSA (AHI=28±23 events/h) and were obese (BMI=32±7 kg/m2). ~10% were predicted to fully respond (AHI< 5 events/h) to OAT, ~43% to achieve an AHI< 10 events/h and 42% to have a 50% reduction in AHI. Conversely, ~41% of participants were predicated to not respond to OAT across all 3 treatment definitions.
Conclusion: While further prospective validation is required, these real-world data suggest that application of a novel physiology based OSA endotype algorithm using standard clinical and home sleep study information may be helpful to identify successful candidates for OAT (and vice versa) in a substantial proportion of people diagnosed with OSA with greater accuracy that current clinical practice.
Support (if any): DJE is funded by a National Health and Medical Research Investigator Grant (1196261).

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0603

TRANSFORMING OBSTRUCTIVE SLEEP APNEA TREATMENT: TELEHEALTH AND MANDIBULAR ADVANCEMENT DEVICES

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Introduction: Effective obstructive sleep apnea (OSA) treatment can potentially reduce the risk and the public health burden of OSA. While continuous positive airway pressure (CPAP) therapy remains the gold standard for treating OSA, long-term adherence is suboptimal. Although adherence to mandibular advancement devices (MADs) is higher, long-term data is lacking. This study explores the potential of MAD to i) improve patient symptoms and clinically relevant parameters and ii) evaluate telehealth as a platform to increase MAD accessibility and address the public health burden of OSA.
Methods: The electronic medical records of patients administered a MAD for OSA at an academic medical facility from 2019 to 2023 were evaluated. Patient demographics and mode of healthcare delivery were extracted. For patients who received a

MAD, variables from their diagnostic polysomnography, like the Epworth Sleepiness Scale (ESS) and the apnea-hypopnea index (AHI), were compared with those from follow-up polysomnography with the MAD. These variables were also compared between the in-person and telehealth cohorts.

Results: 176 patients received a MAD for OSA treatment (56 ± 16 years of age, BMI 31 ± 7 kg/m2, 59% female, 82 White, 20% Hispanic/Latino). 37% and 59% of initial visits used telemedicine or teledentistry, respectively. Insurance coverage included AHCCS (26%), Medicare (20%), and commercial insurance (79%) as primary or secondary. The baseline ESS was 8 ± 4 (range 1-24). Initial diagnostic sleep study noted an AHI of 18 ± 15/hour (range 5-109.9/hour; supine 22±18/hour, lateral 14±25/hour), minimum oxygen saturation of 81 ± 7, sleep efficiency of 74 ± 16/hour, and an arousal index of 24 ± 19/hour. In the follow-up polysomnography with the MAD, significant differences were noted in AHI (p=0.0062) regardless of the frequency of in-person or telehealth encounters. While significant differences were not noted in ESS for the overall cohort (p=0.11), ESS improvement was significant in the telemedicine (p=0.03) and teledentistry (p=0.018) cohorts.

Conclusion: MAD use can improve clinically relevant parameters in OSA. Telehealth can deliver clinically effective treatment of OSA.

Support (if any): American Academy of Dental Sleep Medicine, American Academy of Sleep Medicine Foundation, National Institutes of Health, The University of Arizona.

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0604

SUBSTANTIAL COST SAVINGS WITH NOVEL ORAL APPLIANCE O2VENT OPTIMA COMPARED TO CPAP THERAPY IN CANADA

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Introduction: There is a common perception that oral appliance therapy (OAT) is more expensive than the continuous positive airway pressure (CPAP) therapy. This may be a prohibitive factor for many clinicians and patients to choose a less intrusive therapy with better compliance. Private insurance payers in Canada offer preferential approvals for CPAP over OAT. While oral appliance costs vary and encompass high dentistry fees, CPAP costs are standard. The novel Oral appliance O2Vent Optima also has standard pricing in Canada. The purpose of this investigation is to examine the costs associated with O2Vent Optima versus the CPAP.

Methods: CPAP costs are partially offset by the governments in Canada, the consumables are paid by the users or private insurance. The replacement schedule for the consumables is manufacturer recommended, followed by the CPAP vendors and insurance payers. These include: mask, hose, filters, wipes, mask replacement cushions, water reservoir, tubing and distilled water. The O2Vent Optima also has additional costs for consumables: connector bands, antibacterial tablets for cleaning and ExVent valves.

Results: Initial CPAP price is $1,500; $1,085 with government subsidy. Yearly expenditure for the CPAP consumables is $1,330. Total cost for a 3- year and 5- year CPAP therapy is: $5,075 and $7,735 respectively. O2Vent Optima retails at $2,500 with the insurance payment, and $2,000 if paid out of pocket. The consumables cost $200/year. Total cost of O2Vent Optima at 3-year and 5- year is: $3,100 or $2,600 and $3,500 or $3,000 respectively. Over a 3- and 5- year period, O2Vent Optima resulted in a net saving of $1,975 and $4,235 over CPAP. Daily cost burden of CPAP at 3- and 5- year is $4.63 and $4.24 compared to $2.83 and $1.92 at 3- and 5- year with O2Vent Optima.

Conclusion: Therapy with CPAP compared to OAT with O2Vent Optima costs 165% more at 3 years and 220% more at 5 years. Based on this analysis, it is anticipated that private insurance payers in Canada will endorse a cost-effective and better tolerated therapy with novel oral appliance O2Vent Optima, in addition to the CPAP.

Support (if any): This investigation was sponsored by Open Airway Dental Solutions Ltd. (OADS)

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0605

TEMPOROMANDIBULAR AND ORAL PARAFUNCTION AS RISK FACTORS FOR JAW PAIN RELATED TO ORAL APPLIANCE THERAPY

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Introduction: Oral Appliance Therapy (OAT) is a management option for patients with Obstructive Sleep Apnea (OSA). A reported drawback to OAT is symptoms relating to Temporomandibular Joint Disorder (TMD), including post-procedure jaw pain. Some studies reported TMD in over 50% of patients prior to OAT. The aim of this study was to evaluate the prevalence of TMD and oral Parafunction Habits (PFH) in patients with OSA referred for OAT, and determine any relationship between patient characteristics, demographics, medical history, and degree of OAT advancement with post-procedure jaw pain.

Methods: A retrospective analysis was conducted, reviewing the electronic health records of 125 patients with OSA referred to the division of dental sleep medicine in Mayo Clinic Rochester, for OAT. Records reviewed included patient demographics, TMD-PFH symptoms and signs before and after initiation of OAT, self-reported history of, and signs of PFH, AHI pre-initiation of OAT, presence of fibromyalgia, SSRI use, and percent advancement of appliance at time of re-evaluation.

Results: The median age of patients reviewed was 58 (Interquartile Range (IQR) 20), median BMI 30.5 (IQR 7), median AHI 11.3 (IQR 9.5). 57% were male, 43% female. 20.8% patients had TMD history, 37.6% had TMD signs, 47.2% had PFH history (jaw clenching, lip biting, and/or thumb sucking). 96% had signs of PFH. 15.2% reported post-procedure jaw pain. There was a statistically significant relationship between both TMD history and TMD signs, with post-procedure jaw pain (p value 0.002 and 0.013 respectively), although after multivariate analysis, only TMD history remained associated with post-procedure jaw pain (Odd's Ratio 3.385, 95% Confidence Interval 1.081 – 10.601, p value = 0.036). Age, BMI, gender, PFH signs and history, SSRI use, fibromyalgia history, % advancement of OA had no statistical association with post-procedure jaw pain.

Conclusion: Having a history of TMD symptoms prior to OAT is a risk factor for post-OAT jaw pain. A thorough oral and maxillofacial history in patients being considered for OAT is important to identify patients with TMD history, to establish a clear path to initiate OAT and to closely monitor, reduce or potentially eliminate the reported side effect.

Support (if any):

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0606

POST MARKET SURVEILLANCE FROM PRECISION OAT CASES INDICATES HIGH LEVELS OF PATIENT AND PROVIDER SATISFACTION

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Introduction: Post Market Surveillance has emerged as an important tool for assessing the total quality of medical devices, including patient and provider experience and human factors. To prepare for forthcoming medical device directives that require more comprehensive post market surveillance, at least one manufacturer has implemented a program. This scientific abstract reports data from this program.
Methods: Post market surveillance cards from 10,880 patients and 646 individual providers were returned over a 60 month period to the manufacturer, immediately following delivery of each precision oral appliance therapy (OAT) device (ProSomnus Sleep Technologies, Pleasanton, CA, USA).
Results: 98% of patients and provider reported a "First time fit" meaning the initial quality of the precision OAT was robust; 2% of precision OAT devices required adjustments or for the device to be remade by the manufacturer. 99% of patients reported being "satisfied" with their precision OAT device upon delivery. And 98% of providers reported being satisfied with the precision OAT device upon delivery to the patient. 100% of providers reported that they, "would recommend the treatment."
Conclusion: These results contrast with provider satisfaction reported previously for other OSA treatments. A study by Fletcher Spaight of 100 physicians board certified in sleep medicine reported 60% satisfaction for legacy, non-precision OAT devices, and 68% satisfaction for CPAP.Precision OAT devices made from precision, digital manufacturing processes are associated with high levels of satisfaction amongst patients and providers in this large sample size post-market surveillance dataset.
Support (if any): No support provided for this study The authors disclose their association with ProSomnus sleep technologies, who provided this dataset.

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0607

UPDATE ON OBSERVATIONAL RESTROSPECTIVE STUDY OF THE EFFICACY OF ORAL APPLIANCE THERAPY FOR OBSTRUCTIVE SLEEP APNEA

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Introduction: Obstructive sleep apnea (OSA) affects approximately 15-30% of males and 10-15% of females in North America. While positive airway pressure (PAP) therapy remains the standard in the treatment of OSA, oral appliance therapy (OAT) has emerged as a viable non-invasive alternative. However, there are limited data on OAT efficacy published, and therefore many sleep clinicians question its efficacy. As an update to last year's presentation, we extended our single-center consecutive chart review to 26 months to evaluate OAT efficacy.
Methods: A manual chart review was performed for records from 11/1/2020 to 12/20/2023. Potential charts were identified in the electronic health record by searching for prescriptions for OAT and orders for home sleep apnea tests (HSAT). If there was a test performed after the prescription was written, the chart was reviewed manually for previous test results and verified that post-OAT testing was conducted. Extracted information included age, BMI, gender, pre-OAT HSAT apnea-hypopnea index (AHI), and post-OAT HSAT AHI. The 4% desaturation criteria for AHI was used in accordance with current Medicare guidelines. A paired t-test was performed after ensuring there were no outliers and a normal distribution.
Results: There were 34 patients included in the analysis: 17 women, 17 men. The average age was 60.2 years (95% CI XXX), and average BMI was 29.5 (95% CI XXX). Prior to intervention, 12 patients had moderate OSA with the rest mild (average pre-OAT AHI 10). After OAT device, 2 patients had more than mild obstructive sleep apnea,18 patients had mild OSA, and the rest (14) did not have residual OSA (average post-OAT AHI 6). The results of the paired t-test showed that the mean AHI was statistically significantly different between the two groups.
Conclusion: The results demonstrate efficacy of OAT in treating OSA. Clinicians should consider OAT as both primary and secondary therapy for mild-to-moderate OSA.
Support (if any):

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0608

NO ADVERSE EFFECTS FROM EXPIRATORY POSITIVE EXPIRATORY PRESSURE (EPAP) ENHANCED MANDIBULAR ADVANCEMENT DEVICE (MAD)

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Introduction: The ExVent is an optional accessory to the O2Vent Optima mandibular advancement device (MAD) and provides oral Expiratory Positive Airway Pressure (EPAP). Oral EPAP with the ExVent is designed to provide upper airway support via similar mechanisms of action of nasal EPAP devices in commercial distribution, e.g., passive dilatation of the airway, which reduces flow limitation. Nasal EPAP devices are in commercial distribution as stand-alone therapies for the treatment of OSA. The oral EPAP provided by the ExVent accessory augments the OSA therapy provided by the O2Vent Optima. Long-term complications and adverse effects associated with this combination therapy are not known, but require further study.
Methods: We conducted a retrospective survey of all patients who received O2Vent Optima mandibular advancement device and oral expiratory positive pressure accessory (ExVent) in Canada and Australia from 2019 to November 2022. A study investigator contacted the participants via telephone, obtained consent and collected data on: demographics, duration of use, frequency of use, complications and adverse events.
Results: Out of the patient database of 480 subject, 168 (35%) participated. 31 (18%) stopped using the appliance. Out of 137 (81%) subjects, 118 (86%) were still using the ExVent Accessory, 92% medium strength (Yellow). Mean age 52±7 yrs, 76% Male. Mean duration of use 2.7±0.9 years, 91% for most nights, 86% for >6 hours/night. 56% used morning aligner and 74% performed regular jaw exercises. After 4 weeks of use, excessive salivation was occasional (12%), tooth and jaw pain occasional (8%), tooth movement none (0%). Gum /tongue bruises reported

in none (0%). TMJ pain/stiffness reported (5%). Change in bite or occlusion leading to discontinuation none (0%), temporary chewing difficulties (24%), dry mouth none (0%). Difficulty with insertion/removal of ExVent valve none (0%), difficulty breathing in none (0%), Malfunctioning/dislodgement of ExVent valve reported in none (0%). Participants reportedly loved their device (94%) and benefited from ExVent (100%).
Conclusion: This retrospective study demonstrated that majority of patients prescribed EPAP enhanced MAD with O2Vent Optima and ExVent accessory were compliant. There were no significant complications and only minor adverse effects were observed with the combination therapy.
Support (if any): Centre for Sleep and Chronobiology, Toronto, ON, Canada

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0609
IMPROVED SLEEP QUALITY WITH EXPIRATORY POSITIVE AIRWAY PRESSURE ENHANCED MANDIBULAR ADVANCEMENT DEVICE IN OSA

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Introduction: The ExVent is an optional accessory to the O2Vent Optima mandibular advancement device (MAD) and provides oral Expiratory Positive Airway Pressure (EPAP). Oral EPAP with the ExVent is designed to provide upper airway support via similar mechanisms of action of nasal EPAP devices in commercial distribution, e.g., passive dilatation of the airway, which reduces flow limitation. The oral EPAP provided by the ExVent accessory augments the OSA therapy provided by the O2Vent Optima. Long-term benefits on sleep quality and daytime functioning with combination therapy have not been studied.
Methods: We conducted a retrospective survey of all patients who were prescribed O2Vent Optima mandibular device and oral expiratory positive pressure accessory in Canada and Australia from 2019 to November, 2022. A study investigator contacted the participants via telephone and obtained consent to participate. Data collected included: demographics, duration of use, frequency of use, daytime sleepiness, bed partner reported snoring, sleep satisfaction, morning and daytime functioning, daytime tiredness/fatigue and bed partner's sleep.
Results: Out of the patient data base of 480 subject, 168 (35%) participated. 31 (18%) stopped using the appliance. Out of 137 (81%) subjects, 118 (86%) were still using the ExVent Accessory, 92% medium strength (Yellow). Age 53±7 yrs, 76% Male. Data showed mean duration of use 2.7±0.9 years, mean frequency of use - most nights (91%), use >6 hours/night (86%). Sleep quality was compared from before to after therapy. Daytime sleepiness improved to none/mild from moderate/severe (96%). Bed partner reported snoring improved to none/mild from moderate/severe (94%). Participants slept very well/reasonably well compared to not well/not well at all (82%), woke up more refreshed most mornings compared to some/rare mornings (86%), functioned very well/reasonably well to not well/not well at all (88%), felt fatigue and tiredness none of the time compared to some/all the time (83%), bed partner's sleep interruption was none/some of the time from all the time (95%).
Conclusion: This retrospective study demonstrated that majority of subjects prescribed EPAP enhanced MAD with O2Vent Optima and ExVent were compliant, experienced improved sleep quality, daytime functioning and their partner's sleep was significantly less interrupted.
Support (if any): Centre for Sleep and Chronobiology, Toronto, Canada

Abstract citation ID: zsae067.0610

0610
MOUTH TAPING, NIGHTTIME EXERCISES, ACUPUNCTURE AND MORE: WHO SEEKS OUT SOLUTIONS TO STOP SNORING?

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Introduction: Snoring affects roughly 90 million Americans. Although snoring may indicate a serious health condition such as obstructive sleep apnea, most people attempt to manage snoring using alternative over-the-counter strategies. The present study examined the use patterns of alternative strategies across sociodemographic factors.
Methods: Data were obtained from households in the USA, UK, and Australia that had attempted to stop snoring using alternative strategies (N=4,346). Variables of interest included age, sex, race/ethnicity, country, employment, urban environment, and prior diagnosis of sleep apnea, chronic pain, depression, or anxiety.
Results: Older age was generally associated with using extra pillows, humidifier, cutting alcohol, nasal strips/stents, nasal sprays, saline rinses, and sewing a tennis ball into a shirt. Males were more likely to use honey/lemon, change sleeping position, Vaseline on the nose, snoring exercises, tennis ball, and nighttime exercise, and less likely to use extra pillows. Hispanics/Latinos were more likely to use honey/lemon, anti-snore pillows, snoring exercises, mouth taping, saline rinses, nighttime exercise and cutting alcohol; Blacks/African-Americans were less likely to use nasal strips/stents or sprays and more likely to use nighttime exercise; Asians were more likely to use mouth taping; Native/Indigenous groups were more likely to change sleeping position, use snoring exercises, and increase water intake at night. Australians were more likely to use extra pillows, hot showers, and nighttime showers and exercise. People from the UK were less likely to use humidifiers, nasal strips/stents, nighttime showers, or hot showers. Urban individuals were more likely to use acupuncture, Vaseline, snoring exercises, mouthguards, and mouth taping. Rural individuals were less likely to employ nearly all of the approaches. Employed individuals and those with a history of sleep apnea, chronic pain, depression, and/or anxiety were more likely to employ nearly all of the strategies.
Conclusion: Alternative strategies for managing snoring varied across demographic groups. Males, older adults, and those with a history of chronic pain, obstructive sleep apnea, depression, and/or anxiety were more likely to utilize a wider array of strategies. Future work should explore whether people who use specific alternative strategies are more likely to have an undiagnosed condition such as obstructive sleep apnea.
Support (if any): Rhinomed Ltd; #R01DA051321

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0611

GAMIFICATION OF DIGITAL OROPHARYNGEAL EXERCISES IMPROVES THERAPY ADHERENCE IN OSA PATIENTS

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Introduction: OSA is caused by the interaction of impaired upper airway anatomy and dysfunctional upper airway muscle response to airway narrowing during sleep. Oropharyngeal exercises focused on training upper airway muscles are effective in reducing OSA severity and symptoms. However, similar to other physical therapy programs, oropharyngeal exercises require patients to complete multiple therapy sessions which affects patient compliance. To address this, we developed a smartphone application to provide oropharyngeal exercise and tested the effect of adding gamification and habit formation techniques on therapy adherence.

Methods: The experimental app which included oropharyngeal exercise therapy administered using voice-controlled games, a reward system, a reminder system, and supportive video content was compared to the control app that included text-based exercise therapy instructions and limited video content. Participants with mild to moderate OSA were randomly assigned (1:1) to either group. Demographics, sleep apnea variables, therapy progress, self-reported snoring severity questionnaires were collected for both groups. Appropriate descriptive statistics were used to summarize baseline and outcome data.

Results: 30 participants (13 male), mean age 60.7 ± 11.1 years were randomized equally to the experimental and control groups. 9 participants (6 in the experimental group and 3 in the control group) were unable to complete the study due to technical challenges with the apps and were excluded from analysis. No statistically significant differences were noted in either group's baseline demographic and OSA measures. 7/9 (78%) participants in the experimental group vs 7/12 (58%) in the control group met the prespecified compliance thresholds for the 8 weeks therapy period. Self-reported snoring severity mean scores were significantly reduced in the experimental group (from 2.86 to 1.43, p-value 0.04) compared to the control group (from 2.14 to 1.77, p-value 0.21).

Conclusion: Addition of gamification and therapy monitoring techniques improve compliance to the prescribed oropharyngeal exercises in patients with OSA. Further studies are needed to establish the efficacy of gamified oropharyngeal therapy in the treatment of OSA.

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0612

ADENOTONSILLECTOMY DURING CHILDHOOD DOES NOT ELEVATE THE LIKELIHOOD OF ADULTHOOD OVERWEIGHT

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Introduction: Adenotonsillectomy for pediatric obstructive sleep apnea (OSA) might not promote healthy body weight in the short term, as overweight children could still experience accelerated weight gain and increased risk of obesity. Limited data exists regarding the long-term effect of adenotonsillectomy on body mass index (BMI) as individuals enter their third decade of life. Our study investigated BMI twenty years following adenotonsillectomy or watchful waiting (WW).

Methods: Between 1998 and 2000, we enrolled 260 children with OSA, as defined in our previous study (PMID: 14754948). Among them, 132 had undergone adenotonsillectomy, 127 WW, and one participant died from cardiac arrest. All patients have been members of Clalit Health Services (CHS), Israel's largest healthcare organization, for over 25 years. CHS offers compulsory healthcare coverage via the National Health Insurance Law and employs a unified medical record system. Polysomnography records were obtained from the sole pediatric Sleep-Wake Laboratory in southern Israel. In June 2023, we received adulthood anthropometric data from the original study participants' electronic medical records.

Results: Both groups had moderate OSA and showed no differences in their initial BMI z-scores, which were -0.2 ± 1.6 and 0.1 ± 1.4 ($p = 0.5$) for the WW and adenotonsillectomy groups. The twenty-year follow-up indicated similar BMIs of 26.0 ± 5.8 (kg/m2) for the WW group and 25.5 ± 6.4 (kg/m2) for the adenotonsillectomy group ($p = 0.5$). However, children with baseline BMI z-scores ≥ median, especially females ($p < 0.05$), exhibited higher BMIs after 20 years. Following accounting for sex, apnea-hypopnea index, and socioeconomic status, it was found that adenotonsillectomy did not elevate the risk of being overweight (BMI ≥ 26) in the third decade of life. Females had a higher likelihood of being overweight (OR = 2.22, 95% CI: 1.10-4.58), as did individuals with childhood BMI z-scores ≥ median (OR = 4.67, 95% CI: 2.39-9.82).

Conclusion: Childhood adenotonsillectomy does not increase the risk of being overweight. High BMI z-scores correlate with an increased risk of adult overweight, unaffected by adenotonsillectomy. Adenotonsillectomy does not impact future BMI, highlighting the importance of promoting a healthy childhood lifestyle to prevent adult obesity.

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Abstract citation ID: zsae067.0613

0613

REFERRAL PATTERNS FOR SLEEP SURGERY IN PATIENTS WITH OBSTRUCTIVE SLEEP APNEA

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Introduction: Surgical management of Obstructive Sleep Apnea (OSA) is utilized in patients unable to tolerate positive airway pressure (PAP). The American Academy of Sleep Medicine (AASM) recently published guidelines for referral for surgical consultation. The aim of this study was to characterize surgical referrals from an academic sleep medicine practice.

Methods: A retrospective chart review was conducted of 249 patients referred for sleep surgery from a sleep medicine practice from 01/01/2016 to 01/01/2023. All patients were initially evaluated by a sleep medicine provider at National Jewish Hospital. All patients considering sleep surgery were referred to the University of Colorado. A total of 142 patients (57.0%) completed at least one visit for surgical consultation. Demographics, polysomnographic parameters, details from evaluation in sleep surgery clinic and eventual surgical treatment were assessed.

Pearson chi-square test, fisher exact test were utilized for ordinal variables. Analysis of variance and student t tests were utilized for continuous variables to determine statistically significant relationships with P< 0.05.
Results: Those completing a surgical visit were older at time of referral with mean (SD) age 59.0 (14.0) compared to 54.4 (14.5). Of patients referred for surgery, 24 (8.4%) had BMI>40, 43 (19.7%) had AHI< 15 and 27 (10.8%) had AHI>65. The majority, 107 of 142 (75.4%), of patients completing surgical evaluation did not undergo eventual surgery. Of the non-surgical cohort, 49 (45.8%) underwent a repeat trial of PAP, 22 (20.6%) had repeat sleep testing and 10 (9.3%) underwent trial of oral appliance therapy.
Conclusion: Sleep surgery is a viable alternative to management of OSA. In this study, a large proportion of patients originally referred for surgical evaluation did not complete follow up. Furthermore, the majority of patients seen in surgical clinic did not necessarily undergo surgery for OSA. Non-surgical modalities remained an option for patients with sleep surgery referral and likely enhanced decision-making by informing patients of risks and benefits of both surgical and non-surgical management. Further efforts should be made to understand reasons for incomplete follow-up or pursuit of non-surgical options to optimize surgical referrals for OSA.
Support (if any):

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0614
COMPARISON AND OUTCOMES OF ADENOTONSILLECTOMY FOR OBSTRUCTIVE SLEEP APNEA IN CHILDREN WITH ACHONDROPLASIA

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Introduction: Achondroplasia, a genetic disorder arising from a FGFR3 mutation, is typically detected perinatally, and affects 1 in 40,000 children. The diagnosis of achondroplasia has many associated medical complications, one of which is obstructive sleep apnea (OSA). The objective was to compare demographics between children with achondroplasia and OSA with the general pediatric population with OSA, as well as present treatment outcomes for children with achondroplasia.
Methods: Retrospective chart review of 22 children with achondroplasia and OSA. A sample of 141 children with OSA without achondroplasia was used as a control. Parameters from polysomnography (PSG) were recorded and analyzed. Values before and after adenotonsillectomy (T&A) were compared for the achondroplasia group, while baseline values were compared between the control group and achondroplasia group.
Results: In the achondroplasia group, 12 children who were treated with T&A were included. In the control group, 141 children were included. In the T&A achondroplasia group, 0 children had mild OSA, 1 had moderate OSA, and 10 had severe OSA. In the comparative group 16 had mild OSA, 11 had moderate OSA, and 114 had severe OSA. The achondroplasia population had a much younger age at T&A compared to the control population (p-value < 0.001.) Obstructive Apnea-Hypopnea index, a marker of OSA severity, trended toward being higher in the achondroplasia group (p-value = 0.06). The lowest SpO2 saturation was not significantly different in the achondroplasia group. When comparing baseline data in the achondroplasia population with respective T&A outcomes, both oAHI (p-value < 0.05) and SpO2 (p-value < 0.05) were significantly improved.
Conclusion: Patients with achondroplasia and OSA have an earlier age of onset compared to children without achondroplasia. For these patients, treatment with adenotonsillectomy shows a significant improvement in OSA severity. Future research needs would be to increase sample sizes, establish a standard treatment for OSA in children with achondroplasia, and also establish improvement and treatment frequency by OSA severity. There is also a need to compare the improvement of OSA in children undergoing other interventions and compare these to the general pediatric population.
Support (if any):

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0615
DISE-CRYOTHERAPY A NOVEL TREATMENT FOR PATIENTS WITH OBSTRUCTIVE SLEEP APNEA

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Introduction: Drug induced sleep endoscopy (DISE) can provide valuable information about the level (VOTE), pattern and degree of upper airway obstruction in patients with obstructive sleep apnea (OSA). Integrating DISE with cryotherapy can provide a novel and successful treatment for OSA patients. The objective of this study was to examine safety and efficacy of a novel DISE-Cryotherapy technique in treating OSA.
Methods: A prospective single-arm interventional trial was done after institution review board approval and formal patient consent. Thirty adult subjects with confirmed OSA underwent DISE and cryotherapy in two sessions with two weeks interval using a flexible cryocanalization probe (78 cm in length/2.4 mm in diameter, ERBE, Medizintechnik GmbH, Tübingen, Germany) with cryomachine (ERBECRYO CA, ERBE, Tübingen, Germany). Polysomnogram (PSG) was done pre-intervention and repeated 12-weeks post-intervention. Primary outcomes were reduction in baseline DISE score and apnea hypopnea index (AHI), and improvements in excessive daily sleepiness (EDS) and other OSA related symptoms. Patients follow up was done at two-weeks and, and 12-weeks post-intervention.
Results: Twenty men and 10 women with OSA were included in the study. There mean (SD) age and BMI were 42.57(9.52) years and 32.28 (3.19), respectively. Preoperative Mallampati, tonsillar size and VOTE mean scores were 2.4 (0.49), 1.33 (0.47) and 2.7 (1.02) respectively. Preoperative mean AHI and desaturation index were 31.10 (19.15) and 29.01(20.40), respectively. A two-week post cryotherapy evaluation showed reduction in the mean of VOTE score to 1.6 (0.93) and significant improvements in all sleep related clinical symptoms. Twelve-week post cryotherapy assessment revealed a significant reduction in the mean AHI, and desaturation index to 10.07 (7.65), and 10.3(8.33) respectively. The median (range) of percentage reduction in baseline AHI was 71.36% (42.05-86.38). Above 50% reduction in baseline AHI was achieved in 90% of patients with a mean of 70.63%, while only 10% showed 20-50% reduction with a mean of 45.78%. Significant independent predictors for percentage reduction were age and preoperative total VOTE score. No immediate or remote side effects were reported.
Conclusion: Cryotherapy is a safe and promising intervention for treatment of OSA patients.
Support (if any): No

Abstract citation ID: zsae067.0616

0616

EFFECTS OF OROPHARYNGEAL REHABILITATION AFTER TRANSORAL ROBOTIC SURGERY IN PATIENTS WITH OBSTRUCTIVE SLEEP APNEA

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Introduction: To demonstrate the effects of postoperative oropharyngeal rehabilitation on inflammatory mediators and antioxidant capacity in adult obstructive sleep apnea patients.
Methods: Obstructive sleep apnea patients were recruited and divided into conservative treatment group (n = 17), surgery group (n = 23), or surgery combined with oropharyngeal rehabilitation group (n = 19) by their willingness. Polysomnography data and the concentration of inflammatory mediators and antioxidant capacity were determined at baseline, after 6 weeks and 18 weeks of treatment.
Results: The data of fifty-nine patients was analyzed. Post-treatment percent change of apnea–hypopnea index in rapid eye movement sleep was positively correlated with that of interleukin-6 (0.641, 95%CI 0.598 to 0.685; P<.001). Compared with the patients in control group, those in surgery combined with oropharyngeal rehabilitation group had significantly reduced post-treatment percent change of interleukin-6 (-77.273, 95%CI -144.580 to -9.966; P=.216). In addition, the concentration of interleukin-6 (-3.423, 95%CI -6.638 to -0.207; P=.037) and matrix metallopeptidase-9 (-20.517, 95%CI -40.584 to -0.450; P=.045) exhibited significantly decreased in the surgery combined with oropharyngeal rehabilitation group. The level of total antioxidant capacity exhibited significantly improved in the surgery combined with oropharyngeal rehabilitation group as compared to the surgery–only group (0.034, 95%CI 0.005 to 0.063; P=.020).
Conclusion: The presented results demonstrate postoperative oropharyngeal rehabilitation could decreased the serum level of inflammatory mediators and increased antioxidant capacity. Results from this study could potentially be targeted by combination of different treatments.
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0617

EFFICACY OF NASAL EXPIRATORY POSITIVE AIRWAY PRESSURE IN VETERANS WITH OBSTRUCTIVE SLEEP APNEA

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Introduction: Nasal expiratory positive airway pressure (EPAP) stands as a viable therapeutic solution for individuals with obstructive sleep apnea (OSA). Bongo Rx (AirAvant Medical, Deerfield Beach, Florida) has obtained FDA clearance for treating patients with mild-to-moderate OSA despite limited publication. Amidst the global continuous positive airway pressure (CPAP) shortage, veterans with mild to moderate OSA were presented with the option of Bongo Rx. Individuals who opted to use Bongo Rx for a minimum of one month were subjected to WatchPAT testing (Itamar/ZOLL, Atlanta, Georgia) while on Bongo Rx. This retrospective study aimed to assess the efficacy of Bongo Rx in veterans who underwent follow-up WatchPAT within 12 months from the initial baseline.
Methods: Retrospective chart review. OSA-related measures were compared before and after Bongo Rx using paired t-tests to compare means or Wilcoxon signed-rank tests when values were highly skewed.
Results: Twenty-two veterans with OSA met the eligibility criteria and their data were analyzed. Mean age 60; M:F ratio 16:6; BMI 33.5; 15 White (68%), 6 Black (27%), and 1 Pacific Islander (5%); 10 veterans had mild OSA (45%), 10 moderate OSA (45%), and 2 severe OSA (9%). Overall, Bongo Rx reduced mean WatchPAT Apnea-Hypopnea Index (AHI) by 40% (baseline AHI 16.6 and Bongo-AHI 10.0, p=0.0007), mean respiratory disturbance index (RDI) by 41% (baseline RDI 19.4 and Bongo-RDI 11.5, p=0.0003), and mean oxygen desaturation index (ODI) by 31% (baseline ODI 14.4 and Bongo-ODI 9.9, p=0.0038). Mean SpO2 nadir increased by 2.4% (baseline SpO2 nadir 82% and Bongo SpO2 nadir 84%), median time with SpO2 under 88% (T88) decreased by 58% (baseline T88 1.2 min and Bongo-T88 0.5 min), and these changes were not statistically significant (all p>0.05). Notably, the two severe OSA cases showed 73% and 42% improvement of AHI (baseline AHI 37.0 and Bongo-AHI 7.7 in one, and baseline AHI 38.4 and Bongo-AHI 22.2 in another).
Conclusion: Nasal EPAP with Bongo Rx seems efficacious in reducing AHI, RDI, and ODI in patients with mild to moderate OSA. The efficacy of Bongo Rx in severe OSA should be explored in future research. Further investigation into tolerance and adherence is warranted.
Support (if any):

Abstract citation ID: zsae067.0618

0618

PHRENIC NERVE STIMULATION FOR CENTRAL SLEEP APNEA: A SINGLE INSTITUTION EXPERIENCE

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Introduction: Central sleep apnea (CSA) is a form of sleep disordered breathing where there is a lack of drive to breathe during sleep. CSA has been associated with symptoms of poor sleep and daytime sleepiness. Moderate to severe CSA (central apnea index (CAI) >=15 central apneas/hour of sleep) has been associated with increased risk of heart failure, depressed heart rate variability, and higher incidence of nonsustained ventricular tachycardia [2-4]. Treatment of CSA has mainly centered around positive airway pressure (PAP) therapy. Phrenic nerve stimulation (PNS) was approved in 2017 for moderate to severe CSA. PNS is an implantable device that transvenously stimulates the phrenic nerve in order to stimulate the hemidiaphragm. PNS therapy was approved after the remedē System Pivotal trial that showed

a ≥ 50% reduction in AHI and improvement in patient global assessment scale in patients with moderate to severe CSA [12].
Methods: This is a retrospective analysis of patients ≥ 18 years of age who had PNS implanted for moderate to severe CSA at the OSUWMC. Patient data was gathered prior to implant and at a follow-up visit one year after implant to assess efficacy and safety. Data collection including sleep study results, Epworth Sleepiness Scale (ESS) scores, and Functional Outcomes of Sleep Questionnaire (FOSQ) scores were assessed at baseline and one-year post-implant.
Results: Twenty-two patients were implanted with PNS at OSU between February 1, 2018 and May, 31, 2022. The AHI improved from a median of 40 events/hour at baseline to 18 at follow-up (p-value =0.003). This improvement in AHI was primarily from a reduction in the CAI, which was reduced from 16 events/hour to 2 events/hour (p-value of 0.001). The obstructive apnea index, mixed apnea index, and hypopnea index did not significantly change. The ESS scores improved from a median score of 12 to 9 (p-value =0.028). The FOSQ, improved from 15.0 to 17.8 but was not significant (p-value of 0.086).
Conclusion: PNS therapy shows improvement in overall AHI, primarily from the reduction of central apnea events. There was also significant improvement in ESS and a trend to improvement in FOSQ at one-year follow-up. Minimal safety concerns were reported.
Support (if any):

Abstract citation ID: zsae067.0619

0619

DEPRESSION AND TREATMENT USE IN PATIENTS WITH OBSTRUCTIVE SLEEP APNEA ON GLUCAGON-LIKE PEPTIDE 1 RECEPTOR AGONISTS

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Introduction: Depression and obesity are both prevalent among patients with obstructive sleep apnea (OSA). Treating OSA has been shown to improve depressive symptoms. Routine treatment for OSA often includes positive airway pressure (PAP) therapy combined with weight management strategies, including glucagon-like peptide 1 receptor agonists (GLP-1s), which have been approved to treat type 2 diabetes (T2D) and obesity. Little is known about the relationship between GLP-1 use and OSA and depression treatment patterns, or how these may be affected by depression status and gender.
Methods: Administrative insurance claims from 2014-2023 for adult patients with OSA who filled a GLP-1 prescription with ≥1 year of enrollment before and after the first recorded GLP-1 fill (index date) were analyzed. Depression was defined based on ICD-10 diagnosis codes within the year prior to index. Antidepressant use and OSA treatment in the year pre- and post-index were described.
Results: Of 151,529 patients included (mean age 54.3 years; 48.9% female), 26.3% had depression prior to index. Those with depression were more often women (66.2% vs 42.8%). Prevalence of Medicaid insurance (40.9%) and class III obesity (65.7%) was highest among women with depression, compared to men or those without depression. T2D was common (85.7% overall), with higher prevalence among men. Prior to index, approximately 53% of women and 56% of men had evidence of PAP therapy; this decreased slightly to approximately 48% and 51%, respectively, in the year after index, regardless of depression status. Among patients with depression, prevalence of ≥1 antidepressant prescription was consistent pre- and post-index, but higher among women than men in both periods (pre: 86.0% vs 81.0%; post: 86.0% vs. 80.4%). In the year after index, approximately 41% of women and 39% of men discontinued GLP-1s, regardless of depression status.
Conclusion: Among patients with OSA starting GLP-1 therapy, prevalence of PAP-related claims were similar in patients with and without depression and by gender. Antidepressant use remained consistent among men and women with depression. Future research should evaluate the impact of GLP-1 use on treatment patterns by indication (T2D or obesity/overweight).
Support (if any): ResMed

Abstract citation ID: zsae067.0620

0620

EFFECT OF TIRZEPATIDE ON WEIGHT LOSS IN PATIENTS WITH OBSTRUCTIVE SLEEP APNEA AND OBESITY FROM SURMOUNT-1

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Introduction: Obesity has been estimated to be prevalent in 70% of patients with obstructive sleep apnea (OSA). In SURMOUNT-1, phase 3, 72-week, randomized, double-blind clinical trial in participants with obesity or overweight, those treated with tirzepatide achieved significantly greater weight reduction than placebo. Tirzepatide is a glucose-dependent insulinotropic polypeptide (GIP) and glucagon-like peptide-1 (GLP-1) receptor agonist. The current post-hoc analysis assessed efficacy of tirzepatide versus placebo on weight reduction in participants with OSA and obesity or overweight.
Methods: MMRM analysis was conducted in SURMOUNT-1 participants reporting a baseline medical history of "apnoea", "positive airway pressure therapy" or "sleep apnoea syndrome". Weight loss measures were assessed in participants on treatment (efficacy estimand) using the modified intention-to-treat analysis set (participants who received at least one dose of study drug (tirzepatide 5mg, 10mg, 15mg, or placebo)).
Results: There were 197 participants with OSA included in this analysis (tirzepatide 5mg n=41, 10mg n=51, 15mg n=46, and placebo n=59), with baseline age of 48-53 years, body weight 110-122 kg, BMI 39-43kg/m2, presence of hypertension 48-73%, and proportion of females 42-53%. At week 72, estimated treatment difference between tirzepatide and placebo in mean percent weight change was -11.2% (5mg), -18.2% (10mg), and -20.7% (15mg), all P< 0.001. Significantly more participants treated with tirzepatide achieved ≥5% body weight reduction (83-98% treated with tirzepatide, 25% with placebo) and ≥10% body weight reduction (46-93% treated with tirzepatide, 15% with placebo) than those treated with placebo (all P< 0.001). 27-62% of participants treated with tirzepatide achieved ≥20% body weight reduction compared to 0% in the placebo group (tirzepatide 5mg P=0.006, 10mg and 15mg P< 0.001). All doses of tirzepatide significantly reduced waist circumference from baseline to week

72 (-10.6cm, -18.2cm, -18.9cm, all P< 0.001). Placebo did not significantly reduce waist circumference at week 72 compared to baseline (-3.5cm, P=0.053).
Conclusion: Participants with OSA and obesity or overweight treated with tirzepatide had significantly greater weight reduction than those treated with placebo in the SURMOUNT-1 trial. This degree of weight loss would be expected to have a clinically meaningful impact on OSA severity and is being investigated in the SURMOUNT-OSA trial.
Support (if any): Eli Lilly and Company.

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0621
GLUCAGON-LIKE PEPTIDE 1 RECEPTOR AGONIST AND POSITIVE AIRWAY PRESSURE USE IN PATIENTS WITH OSA AND OBESITY

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Introduction: Obstructive sleep apnea (OSA) and obesity are strongly associated and highly prevalent in the United States (US). Routine treatment for OSA often includes positive airway pressure (PAP) therapy combined with weight management strategies, more recently including use of glucagon-like peptide 1 (GLP-1) receptor agonists. This real-world analysis assessed the impact of recent GLP-1 use on PAP therapy use over 1 year in non-diabetic patients with PAP-treated OSA and obesity.
Methods: Administrative claims data from January 2014-May 2023 linked to objective PAP usage data were analyzed. Commercially- or Medicaid insured non-diabetic adults (18-64 years) with OSA and obesity, ≥1 year of claims data before and after PAP setup (index date), and ≥1 year of PAP therapy data post index were included. Patients who filled a GLP-1 prescription within 90 days prior to index were considered recent GLP-1 users. Other GLP-1 users were excluded. PAP therapy adherence was categorized as adherent, intermediately adherent, or non-adherent based on objective usage over 1 year. PAP discontinuation was defined as >30 consecutive days with no use. Inverse probability of treatment weighting was used to balance groups on baseline covariates to compare PAP use over 1 year for OSA patients with and without a recent GLP-1 fill prior to index.
Results: A total of 267,794 patients with OSA were included (mean age 47.7 years; 44.1% female), of which 1,137 (0.43%) were recent GLP-1 users at index. Recent GLP-1 users were more commonly female (66.6% vs 44.0%), commercially insured (82.2% vs 77.7%), and with class III obesity (67.5% vs 46.8%) than those without a recent GLP-1 prescription fill. Average hours/day of PAP use at 1 year did not differ significantly between groups (3.80 vs 3.96). There was no significant difference in PAP adherence rates (adherent: 42.1% vs 45.1%; intermediately adherent: 29.5 vs 28.4%; non-adherent: 28.5 vs 26.5%) or PAP discontinuation (43.9% vs 41.7%) for those with and without recent GLP-1 use prior to index.
Conclusion: PAP use was similar among non-diabetic patients with OSA and obesity who did and did not have recent GLP-1 use prior to PAP.
Support (if any): ResMed

Abstract citation ID: zsae067.0622

0622
REMOTE PATIENT MONITORING TO MANAGE OSA USING A VARIETY OF THERAPEUTIC APPROACHES IN AN ACTIVE SLEEP PRACTICE

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Introduction: Remote Patient Monitoring (RPM) using the REST-Tracker system incorporates FDA cleared SleepImage OSA analysis from a ring oximeter worn nightly providing output metrics corresponding to the AASMs 1A/1B Hypopnea rules (sAHI3%/sAHI4% respectively). The REST-Tracker system assists in improving clinical decisions, reducing treatment failures and lowering the burden of repeated (in-lab/home) OSA sleep testing. Other systems currently in use for OSA management rely on PAP derived indexes, loosely labeled as an AHI equivalent, and are falsely considered by many as equivalent to FDA cleared HSAT derived metrics. Such systems only provide data while using PAP devices and have no utility with other treatment approaches such as Inspire or OAT. Our OSA patients are treated via a variety of therapeutic approaches and we provide here a summarization of our current experience using this new REST-Tracker approach and an additional PAP-subanalysis to assess the sensitivity of the PAP derived AHI metric (pAHI) metric which is used by other RPM systems.
Methods: OSA patients undergoing treatments ranging from PAP, OAT, Inspire, surgery, or in-combination were monitored nightly with the REST-Tracker ring RPM platform. The sAHI3%/sAHI4% output metrics were managed by staff using REST-Tracker and therapy adjusted in accordance with patients' circumstances, optimizing treatment. PAP-subanalysis: A subset of 10 PAP patients data was extracted to compare the pAHI metric to the corresponding sAHIs(3%&4%).
Results: 95 patients monitored, ranging 6-28 months, across all treatment groups (39-PAP, 14-Inspire, 7-OAT, 9-combo-PAP-OAT, 16-combo-Inspire-PAP and 10-Combo-MMA-Inspire/other), with an average Diagnostic 1A AHI=30.4(+/-21.0)/1B AHI=15.65(+/-17.8) improved with most recent 30-day data demonstrating average sAHI3%=11.5(+/- 8.0) sAHI4%=6.3(+/-5.6). For the PAP-subanalysis, duration ranged/per patient from 120-284 nights, Median values of pAHI=2.6, sAHI3%=10.4 & sAHI4%=3.4
Conclusion: The REST-Tracker provides longitudinal nightly assessment giving clinicians objective measures to assist treatment decisions and is superior to single-night testing and agnostic to treatment approaches, unlike other PAP-dependant RPM systems. A more elaborate detailed presentation with clinical examples will be presented at the conference, demonstrating this futuristic approach in sleep health disease management.
Support (if any):

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0623
EFFECTS OF NASAL AND UPPER AIRWAY SURGERY ON PHARYNGEAL COLLAPSIBILITY IN PEOPLE WITH OBSTRUCTIVE SLEEP APNEA

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Introduction: Upper airway surgery reduces obstructive sleep apnea (OSA) severity. However, therapeutic efficacy varies between patients and inter-individual effects on upper airway physiology post-surgery are not well characterized. Nasal surgery alone may help facilitate breathing and CPAP delivery but would not be expected to yield major reductions in upper airway collapsibility per se. Accordingly, this study aimed to assess changes in upper airway collapsibility following nasal and upper airway surgical procedures.

Methods: People with OSA attended the sleep laboratory prior to and ≥3 months following nasal or upper airway surgery. At each visit, airway collapsibility via the upper airway collapsibility index (UACI) technique was assessed just prior to sleep and OSA severity was quantified during overnight polysomnography. To quantify the UACI, participants were instrumented with pressure sensors at the choanae and epiglottis, a sealed nasal mask and pneumotachograph. They were studied awake (verified via EEG) and supine. Brief (250ms) negative pressure pulses were delivered during early inspiration and early expiration (~-12cmH2O at the mask) every 2-10 breaths. The UACI, which correlates well with the critical closing pressure (Pcrit) during sleep, was quantified as the percent difference between nadir choanal and the corresponding epiglottic pressure to ~20 negative pressure pulses.

Results: 7 participants (2 female), aged 47±12years, BMI 29±2kg/m2 with severe OSA had either upper airway surgery (uvulopalatopharyngoplasty combined with coblation channelling of the tongue, n=4) or nasal surgery alone (n= 3). Participants with upper airway surgery had a 58% reduction in upper airway collapsibility (40±18 vs. 17±22%, p=0.049) during early inspiration with similar improvements during expiration (63±9 vs. 38±30%, p=0.01). For nasal surgery only, upper airway collapsibility was not systematically different during early inspiration or expiration.

Conclusion: These preliminary findings indicate major improvements in upper airway collapsibility during wakefulness following upper airway surgery but no systematic changes with nasal surgery alone. Further application of these physiological measures may help explain between patient differences in therapeutic efficacy with upper airway surgery and assist with patient selection to improve treatment success rates.

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0624

A MASS SPECTROMETRY METHOD EVALUATING OREXIN METABOLITES SUGGEST ABNORMALITIES IN HYPERSOMNIAS OF CENTRAL ORIGIN

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Introduction: Narcolepsy type 1 (NT1) is caused by orexin (hypocretin) deficiency with 85-95% loss of orexinergic neurons reported in the hypothalamus. Patients with NT1 have cerebrospinal fluid (CSF) orexin-A immunoreactivity deficiency ≤110 pg/ml, as detected using a polyclonal anti-orexin-A radioimmunoassay (RIA). Although some narcolepsy type 2 patients (NT2) have been reported to have a partial loss of orexinergic neurons, the large majority of patients with NT2 have normal levels of CSF orexin-A. Previous work has shown that the RIA measures < 10% of the intact orexin-A peptide, suggesting that the RIA for CSF orexin-A primarily measures unauthentic orexin-A-related metabolites. In this study, we developed a novel mass spectrometry assay to measure intact prepro-orexin, orexin-A, and orexin-B, and their metabolites, in CSF collected from patients with NT1, NT2, idiopathic hypersomnia (IH), and controls.
Methods: Using a novel sequential immunoprecipitation/mass spectrometry method, all orexin species (intact-long and short-metabolite forms) were comprehensively measured in CSF collected from patients diagnosed with NT1 (N=15), NT2 (N=15), IH (N=15), and controls (N=15). Orexin peptides were analyzed by a nanoAcquity ultra-performance liquid chromatography system coupled to an Orbitrap Tribid Eclipse mass spectrometer.
Results: NT1 showed pan-orexin deficiency with lower predicted levels of prepro-orexin, orexin-A, and orexin-B species compared to NT2, IH, and controls (all $p < 0.05$ after Tukey correction for multiple comparisons). Short-form metabolites of orexin-B differentiated both NT2 and IH from NT1 and from controls (all $p < 0.05$ after Tukey correction for multiple comparisons). Further, the ratio of the shortest form of orexin-B/longer orexin-B species was decreased in NT2 compared to IH and controls (all $p < 0.05$ after Tukey correction for multiple comparisons).
Conclusion: A novel mass spectrometry assay comprehensively measuring different forms of CSF orexin differentiated among the hypersomnias of central origin and may have diagnostic utility. As expected, all forms of orexin were lower in CSF collected from NT1 patients compared to other groups. We also found that short metabolites of orexin-B are reduced in participants with NT2 and IH. Abnormal orexin transmission may also be involved in the pathophysiology of NT2 and IH, with differential impact on orexin peptide species.
Support (if any): R21 AG074151 and Eisai

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0625

PREVALENCE OF SUBJECTIVE LONGER SLEEP TIMES AND SLEEPINESS IN PATIENTS EVALUATED AT A TERTIARY MEDICAL CENTER

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Introduction: The ICSD-3-TR defines idiopathic hypersomnia in terms of objective sleep times as sleeping at least 11 hours using 24-hour polysomnography or wrist actigraphy averaged over at least 7 days. Published studies on sleep duration are generally limited by lower sleep duration cut-offs (e.g., ≥ 9 hours), so prevalence data on longer sleep durations are missing. This study used clinical questionnaire data from Mayo Clinic patients to characterize longer sleep times and excessive daytime sleepiness in this population.
Methods: We retrospectively identified patients who answered questions about subjective sleep times and excessive daytime sleepiness, using the Epworth Sleepiness Scale (ESS), as part of their evaluation in a sleep clinic across the Mayo Clinic Enterprise from 2017 to 2023. Demographic data and sleep disorder diagnoses were then analyzed.
Results: Patients (N=25,480) with subjective nocturnal sleep times of ≥ 9 (n=2721, 10.7%), ≥ 10 (n=1059, 4.2%), and ≥ 11 hours (n=349, 1.4%) had an ESS ≥ 10 in 33.5%, 41.0%, and 51.3% of the time, respectively. 3.6% (age 53.2±19.7; 58.9% female), 1.7% (age 53.1±20.4; 58.1% female), and 0.7% (age 49.8±19.9; 58.1% female) of the patients reported an ESS ≥ 10 and subjective nocturnal sleep times of ≥ 9, ≥ 10, and ≥ 11 hours per night, respectively. After adjusting for age and sex, patients with more than one diagnostic entry compared to those with one or fewer diagnostic entries for idiopathic hypersomnia with long sleep time (OR=12.75, 95% CI [6.09, 24.52], $p < 0.001$) and narcolepsy with cataplexy (OR=5.53, 95% CI [1.31, 15.84], $p=0.005$) were significantly more likely to report ESS ≥ 10 and subjective nocturnal sleep times ≥ 11 hours per night.
Conclusion: Less than 1% of patients presenting to a Mayo Clinic sleep specialist have self-reported metrics (i.e., ESS ≥ 10 and subjective nocturnal sleep times ≥ 11 per night) consistent with basic clinical features of idiopathic hypersomnia with long sleep time. Additional data analyses (e.g., comorbid conditions, social history, and laboratory results) are underway.
Support (if any):

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0626

IMPACT OF WASHOUT TIMING OF PSYCHOTROPIC MEDICATIONS ON THE MSLT

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Introduction: While highly reproducible in narcolepsy type 1, MSLT results are more variable in other CNS hypersomnolence disorders. Use of psychotropic medications is a known contributor to MSLT validity given the high comorbidity of psychiatric illness in patients with hypersomnolence disorders. We leveraged a large MSLT database to study the impact of timing of washout of psychotropic medications with known REM-suppressing effects on MSLT results.
Methods: This was a retrospective analysis of MSLTs performed 2012-2023 at Cleveland Clinic. Medication groups studied included selective serotonin reuptake inhibitors (SSRIs), serotonin and norepinephrine reuptake inhibitors (SNRIs), and tricyclic antidepressants (TCAs). Date of last dose prior to MSLT was collected and categorized as ≤14 days or >14 days prior to MSLT. Multivariable adjusted regression analyses (linear and logistic) adjusting for age, sex, and BMI were conducted to evaluate the influence of a late washout (ie ≤14 days prior to MSLT)

on recording ≥2 sleep onset REM periods (SOREMPs) and on recording a mean sleep latency (MSL) < 8 minutes.
Results: 180 unique MSLTs were analyzed. Of these, 80 patients had recorded use of SSRIs, SNRIs, and/or TCAs leading up to the MSLT, and 63 of these 80 patients used such a medication ≤14 days before the MSLT. Seven of 80 patients (8.8%) had ≥2 SOREMPs, and 27 (33.8%) had MSL < 8 minutes. Logistic regression analysis showed a negative correlation between a late washout and obtaining ≥2 SOREMPs (OR 0.05, p< 0.01), but no significant correlation with obtaining MSL < 8 minutes (p=0.07). Linear regression analysis similarly showed a negative correlation between a late washout and obtaining ≥2 SOREMPs (coefficient -0.77, p>0.001) but no significant correlation with obtaining MSL < 8 minutes.
Conclusion: These findings underscore the importance of appropriately timed REM suppressant washout prior to MSLT to optimize test validity. Further analyses will examine the effects of other CNS-active medication classes in a larger cohort of patients.
Support (if any): NIH grant R21HL170206

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0627

INFLUENZA HA ANTIBODY TITERS IN RECENT ONSET TYPE-1 NARCOLEPSY

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Introduction: Epidemiological studies have shown associations between pandemic H1N1 2009 Influenza-A infection and vaccination (only using Pandemrix®) and the onset of narcolepsy, an autoimmune disease associated with HLA-DQB1*0602. We tested whether recent onset type 1 narcolepsy patients have increased influenza antibody titers comparing with matched HLA-DQB1*0602 positive controls.
Methods: Sera of 82 recent onset type-1 narcolepsy patients (12 [1-25] months) and 84 healthy controls matched by sex, age, and year and season of sample collection were used. Sera were tested for Influenza-A and B HA antibodies using hemagglutinin inhibition (HAI) assays against the dominant strains known to circulate at time of collection. HAI assays against H1N1pdm09 were also tested independently in samples collected after 2009. Antibody titers were log2 transformed into geometric mean, with zero being < 1/10 dilution, 1 as 1/10, 2 as 1/20 etc., so that every dilution represents an increment of 1 unit. Further analysis using multiple variable linear regression and logistic regression were done to analyze association between confounding factors and disease status and HA antibody titers.
Results: H1N1pdm09 HA titers were increased in 25/63 (39.7%) subjects collected after 2009. Increasing HA titers (doubling rate) of H1N1pdm09 [OR=1.2962(1.0513, 1.5984), p=0.015], all H1N1 [OR=1.13(1.03-1.24), p=0.023] and B/Victoria [1.37 (1.16-1.61), p=0.001] were associated with narcolepsy, whereas no association was found with H3N2 and B/Yamagata. Logistic regression shows after controlling sex, age and season of sample collection, narcolepsy is associated with H1N1pdm09 [4.68(1.5281, 14.3392), p=0.007] and B/Victoria strains [5.5306 (2.6039, 11.8224), p=0.001].
Conclusion: Both H1N1 and B/Victoria, but not other strains, may trigger narcolepsy onset. This result is in line with a recent epidemiological study in Europe that reported a strong increase in narcolepsy onset in 2010 (following 2009 H1N1 pandemic) and a secondary peak in 2013 following a season with a dominant B/Victoria infection.
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0628

CONSISTENT EFFICACY OF ONCE-NIGHTLY SODIUM OXYBATE ACROSS PATIENT DEMOGRAPHIC AND BASELINE DISEASE CHARACTERISTICS

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Introduction: Once-nightly sodium oxybate (ON-SXB; LUMRYZ™) was investigated in patients with narcolepsy type 1 (NT1) or 2 (NT2) in the phase 3 REST-ON trial; treatment with 6, 7.5, and 9 g demonstrated significant improvements vs placebo (all P< 0.001) for the coprimary endpoints of change from baseline in mean sleep latency on the Maintenance of Wakefulness Test (MWT), Clinical Global Impression-Improvement (CGI-I) rating, and weekly number of cataplexy episodes (NCA), and the secondary endpoint Epworth Sleepiness Scale (ESS) score. This post-hoc analysis assessed ON-SXB efficacy in various subgroups.
Methods: REST-ON (NCT02720744) participants aged ≥16 years with NT1 or NT2 were randomized 1:1 to ON-SXB (4.5 g, 1 week; 6 g, 2 weeks; 7.5 g, 5 weeks; 9 g, 5 weeks) or placebo for 13 weeks. Least squares mean differences (LSMDs) in changes from baseline for ON-SXB vs placebo for mean sleep latency on MWT, NCA (NT1 only), and ESS, and odds ratios for "much"/"very much" improved on CGI-I, were compared among baseline demographic (age, sex, race, body mass index [BMI] category) and narcolepsy disease characteristic (NT1/NT2; concomitant alerting agent use) subgroups.
Results: The modified intent-to-treat population included 190 participants (ON-SXB, n=97; placebo, n=93). LSMDs for ON-SXB 9 g vs placebo in change from baseline on the MWT at week 13 revealed significant improvements (P< 0.05) for subgroups based on age, sex, race, BMI, narcolepsy type, and alerting agent/no alerting agent use. Odds ratios were significant in favor of ON-SXB 9 g vs placebo for "much" or "very much" improved on CGI-I at week 13 (P< 0.05) for both low/high age, female sex, white/non-white, high BMI, NT1, and alerting agent/no alerting agent use. LSMDs were significant in favor of ON-SXB 9 g vs placebo for change from baseline in NCA (P< 0.05) in all subgroups, except non-white and male. For the ESS, all subgroups exhibited significant improvements (P< 0.05) with ON-SXB 9 g vs placebo, except NT2. Comparable differences were found with the 6-g dose at Week 3 and the 7.5-g dose at Week 8.
Conclusion: Post-hoc subgroup analyses demonstrate the robust efficacy of ON-SXB across demographic and clinical subgroups.
Support (if any): Avadel Pharmaceuticals

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0629

THE LEHIGH VALLEY HEALTH NETWORK NARCOLEPSY COHORT: CLINICAL AND POLYSOMNOGRAPHIC ANALYSIS OF 303 CASES

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Introduction: Narcolepsy has been associated with several psychiatric, cardiovascular and metabolic disorders. This study aimed to analyze the clinical and polysomnographic characteristics of narcolepsy patients within the Lehigh Valley Health Network (LVHN).
Methods: We performed a chart-review of all narcolepsy cases seen between 2000 and 2022. Bivariate analysis highlighted differences between narcolepsy-type I (NT1) and narcolepsy-type II (NT2).
Results: Among 3.3 million patients, 303 (0.0001%, 9 per 100,000) were diagnosed with narcolepsy (51 with NT1, 252 with NT2), based on ICDS-3 diagnostic criteria. Age at symptom onset was 20.5±6.8 years. Diagnostic delay was 4.1 (2.0-8.9) years. Average Epworth Sleepiness Scale (ESS) was 16.9±2.9. Concomitant symptoms were refreshing naps [226(74.6%)], hypnagogic hallucinations [87(28.7%)], disrupted sleep [86(28.4%)], sleep paralysis [77(25.4%)]. Compared to NT2, NT1 patients had earlier age at diagnosis (24.3±8.0 versus 27.6±9.1, p=0.02), shorter diagnostic gap (3.0 vs 4.6 years, p=0.001), more frequent sleep paralysis [27(52.9%) vs 50(19.8%) p< 0.0001], hygnagogic hallucinations [22(43.1%) vs 65(25.8%), p=0.01], higher ESS (17.6±3.3 versus 16.7±2.8, p=0.04). Comorbid sleep disorders were breathing disorders (17.5%), insomnia (15.5%), restless legs syndrome (3.6%), periodic limb movements (2.3%), and REM parasomnias (1.3%). Migraine was the most common neurological disorder (29.7%). Frequent mood disorders included depression (34.7%) and anxiety (32.3%). Depression was more common in NT2 [11 (21.6%) vs 94 (37.3%) p=0.03]. Hypertension, diabetes, and obesity prevalence were not different between the two groups (overall 24.1%, 8.3%, 12.5% respectively). The most common treatments were modafinil (66.3%), methylphenidate (31.3%), armodafinil (28.1%), dextroamphetamine (28.8%), sodium oxybate (8.7%), pitolisant (4.5%), solriamfetol (5.2%). Review of overnight-polysomnography showed an average sleep efficiency of 93%, sleep latency of 12.3 minutes, REM latency of 98.8 minutes, with no differences between NT1 and NT2. Multiple sleep latency test showed an average sleep latency of 3.7 (2.4-5.0) minutes, and more SOREMPs in NT1 (≥3 in 28 (58.3%) vs 64 (27.1%), p< 0.0001).
Conclusion: This study is one of the largest monocentric studies to date of patients with narcolepsy and confirms the frequent comorbidity of narcolepsy with many other disorders. Specific clinical characteristics and comorbidities may help differentiate NT1 from NT2. Further analysis on this dataset is in progress and will be presented.
Support (if any):

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0630

EFFICACY OF SODIUM OXYBATE IN ADULTS WITH IDIOPATHIC HYPERSOMNIA : A RANDOMIZED PLACEBO-CONTROLLED TRIAL

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Introduction: Idiopathic hypersomnia (IH) is a rare central hypersomnolence disorder characterized by excessive daytime sleepiness, prolonged nighttime sleep and sleep inertia. The efficacy and safety of low-sodium oxybate was reported in a phase 3 randomized withdrawal study in IH on Epworth Sleepiness scale (ESS) and Idiopathic Hypersomnia Severity Scale (IHSS). We conducted a phase 3, monocentric, double-blind, randomized, parallel group, placebo-controlled trial of sodium oxybate (SXB) in IH with ESS, IHSS and Maintenance of Wakefulness Test (MWT) assessment.
Methods: Eligible participants 18–60 years of age with IH according to criteria (ICSD3) with ESS ≥14 were randomly assigned to treatment with SXB or placebo in a 1:1 ratio. After a 2-week screening without any CNS drugs and never exposed to oxybate, patients started a 6-week individual twice nightly up-titration scheme from 4.5 g to a maximum of 9 g, treatment was administered at stable dose (6g or 9g) for 2 weeks, followed by a 1-week taper period. The primary endpoint was the mean change from baseline to week 8 on ESS. Key secondary endpoints were safety, changes in average sleep latency on the MWT and IHSS.
Results: Between October 2018 and January 2023, we screened 48 patients, 45 were randomized (36 females, mean age 29.0±7.5, ESS 16.5±2.7, 40 having long sleep time; 22 assigned to SXB and 23 placebo), and 40 (19 receiving SXB and 21 placebo) completed the double-blind period. Between-group differences (SXB vs placebo) for the mean [IC95%] change in ESS from baseline to endpoint were -6.54 [-9.35;-3.73] (p=0.004). Between-group differences for the average sleep latency on the MWT from baseline to endpoint were 13.87 [8.35 ;19.39] (p=0.0001), and for IHSS -10.87 [-15.71;-6.03] (p=0.0004). Treatment-emergent adverse events were reported in 17 (77%) of 22 patients with SXB and 7 (30%) of 23 with placebo. The most frequently reported adverse events were nausea, headache, and dizziness.
Conclusion: SXB resulted in a clinically meaningful improvement in adults with IH, reducing excessive sleepiness on the ESS, improving wakefulness on the MWT and decreasing IH severity on IHSS after 8 weeks. The safety profile was similar to that previously reported with SXB. NCT03597555
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0631

PHASE 2, PROOF-OF-CONCEPT STUDY OF PITOLISANT IN PRADER-WILLI SYNDROME: PRIMARY AND SECONDARY EFFICACY ANALYSES

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Introduction: Prader-Willi Syndrome (PWS) is a complex genetic disorder with symptoms that include hyperphagia, behavioral disturbances, and excessive daytime sleepiness (EDS). Pitolisant is approved for the treatment of EDS or cataplexy in adults with narcolepsy.
Methods: In this phase 2, proof-of-concept study (which was not powered to show statistical significance), patients with a confirmed diagnosis of PWS and a score ≥12 on the parent/caregiver version of the Epworth Sleepiness Scale for Children and Adolescents (ESS-CHAD) were randomized to receive higher-dose pitolisant, lower-dose pitolisant, or placebo (dose based on age group) for 11 weeks (3-week titration, 8-week stable-dose). The primary efficacy endpoint was change from baseline at Week 11 in ESS-CHAD score. Secondary/exploratory endpoints included the Caregiver Global Impression of Severity (CaGI-S) for EDS, Aberrant Behavior Checklist-2 (ABC-2), and Hyperphagia Questionnaire for Clinical Trials (HQ-CT) (in conjunction with the Food Safe Zone Questionnaire).
Results: Among 65 enrolled patients (50.8% male), 34 (52.3%) were children (6 to < 12 years), 19 (29.2%) were adolescents (12 to < 18 years), and 12 (18.5%) were adults (≥18 years). Overall, mean (SE) change in ESS-CHAD score at Week 11 was greater in the higher-dose (-4.9 [1.23]) and lower-dose (-4.1 [1.06]) pitolisant groups compared with the placebo group (-3.7 [1.13]). There was an unusually large placebo response in the adolescent age group, due to data from a single outlier. Reductions in CaGI-S scores and HQ-CT scores were greater for pitolisant compared with placebo in the children and adult age groups. In children (6 to < 12 years), mean reduction in all ABC-2 domain scores (irritability, social withdrawal, hyperactivity/noncompliance, inappropriate speech, stereotypic behavior) was greater for higher-dose pitolisant compared with placebo. The most common adverse events in pitolisant-treated patients (doses pooled) were irritability (17.4%) and anxiety (13.0%).
Conclusion: Pitolisant reduced EDS in patients with PWS. Pitolisant may also reduce behavioral disturbances and hyperphagia. An upcoming phase 3 clinical trial (TEMPO) will further evaluate the efficacy and safety of pitolisant in patients ≥6 years old with PWS and EDS.
Support (if any): Harmony Biosciences, LLC

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0632
DESIGN ELEMENTS FOR A SWITCH STUDY FROM HIGH- TO LOW-SODIUM OXYBATE EVALUATING BLOOD PRESSURE IN NARCOLEPSY (XYLO)

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Introduction: High sodium intake can increase blood pressure (BP) and future cardiovascular risk. Individuals with narcolepsy have an elevated cardiovascular comorbidity burden before considering medication-specific risks. Low-sodium oxybate (LXB; Xywav®) is approved by the US Food and Drug Administration (FDA) to treat excessive daytime sleepiness or cataplexy in patients ≥7 years of age with narcolepsy and idiopathic hypersomnia in adults. LXB has the same active moiety as high-sodium oxybates (sodium oxybate [SXB, Xyrem®] and fixed-dose SXB [Lumryz™]) but contains 92% less sodium. The objective of XYLO is to measure ambulatory and in-clinic systolic BP (SBP) changes after switching to LXB from a high-sodium oxybate in participants with narcolepsy (NCT05869773).
Methods: This 6-week, open-label, multicenter, switch study is enrolling participants 18–70 years of age with narcolepsy (type 1 or 2) taking 6–9 g/night of high-sodium oxybate for ≥6 weeks. Hybrid enrollment supports both on-site and decentralized (monitored at the participant's home by mobile health professionals) participation, and may broaden the pool of eligible participants. After ≥2 weeks on stable high-sodium oxybate dose/regimens (screening period), participants switch to the same dose/regimen of LXB for 6 weeks (intervention period). The primary endpoint is the change in 24-hour SBP from baseline (the most recent screening measurement prior to switching) to the end-of-treatment visit (approximately 6 weeks after switching) measured via 24-hour ambulatory BP monitoring (ABPM). Secondary endpoints evaluate change from baseline to end-of-treatment visit in-clinic SBP, as well as daytime average SBP and nighttime average SBP measured via 24-hour ABPM.
Results: Recruitment began in June 2023. This study uses a group sequential design with an adaptive sample size target of 57–77 participants completing the 6-week intervention period. This design provides 90% power to detect a mean difference of 3.5 mmHg (a clinically relevant change) in 24-hour SBP (assuming a standard deviation of the differences in 24-hour SBP of 8 mmHg).
Conclusion: XYLO will enable the assessment of 24-hour BP changes following transition from a high-sodium oxybate to LXB. Planned hybrid enrollment with a decentralized option may increase study access leading to a more diverse clinical trial population.
Support (if any): Jazz Pharmaceuticals

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EFFICACY AND SAFETY OF LOW-SODIUM OXYBATE IN NARCOLEPSY PATIENTS WITH/WITHOUT PSYCHIATRIC/NEUROLOGIC COMORBIDITIES

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Introduction: Prior studies report high incidences of psychiatric and/or neurologic comorbidities in patients with narcolepsy. Low-sodium oxybate (LXB; Xywav®) is an FDA-approved treatment for cataplexy or excessive daytime sleepiness in patients ≥7 years old with narcolepsy and for adults with idiopathic hypersomnia. This post hoc analysis of a phase 3 trial (NCT03030599) assessed LXB efficacy and safety in participants with narcolepsy with or without a medical history of psychiatric and/or neurologic comorbidities.
Methods: Participants were adults (18–70 years) with narcolepsy with cataplexy. Participants optimized/titrated their LXB dose (up to 12 weeks) before a 2-week stable-dose period. During a 2-week double-blind randomized-withdrawal period, participants were either switched to placebo or continued LXB. Epworth Sleepiness Scale (ESS), average weekly number of cataplexy attacks, Patient Global Impression of Change (PGIc) scores, Patient Health Questionnaire-9 (PHQ-9) scores, and treatment-emergent adverse events (TEAEs) were evaluated in participants with and without psychiatric and/or neurologic comorbidities.
Results: Of 201 participants, 84 reported baseline comorbidities (most commonly depression, migraine headaches, anxiety, and headache [non-migraine]). Imbalances between subgroups were observed with regard to sex, race, ethnicity, and body mass index. Participants randomized to placebo in both subgroups showed worsening (increases) in ESS scores compared with participants who continued with LXB treatment (least squares mean differences, LXB vs placebo [95% CI], with comorbidities: −3.7 [−5.6, −1.9], P=0.0001; without comorbidities: −2.0 [−3.5, −0.6]; P=0.0050). Participants randomized to placebo in both subgroups had increased weekly cataplexy attacks compared with those continuing LXB (location shift, LXB vs placebo [95% CI], with comorbidities: −4.0 [−7.0, −1.1], P=0.0026; without comorbidities: −3.5 [−9.1, −1.1], P< 0.0001). Participants randomized to placebo in both subgroups showed worsening in PGIc scores compared with LXB (P< 0.0001, for both). Symptoms of depression, as measured by PHQ-9 scores, remained stable in both subgroups. TEAEs and serious TEAEs occurred in 69 (82.1%) and 1 (1.2%) participants with comorbidities, and 84 (71.8%) and 3 (2.6%) without comorbidities, respectively.
Conclusion: In this post hoc analysis of a phase 3 trial in patients with narcolepsy, the efficacy and safety of LXB in participants with psychiatric and/or neurologic comorbidities were similar to those in participants without such comorbidities.
Support (if any): Jazz Pharmaceuticals

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0634

EFFECTS OF SOLRIAMFETOL ON COGNITION ON PATIENTS WITH EXCESSIVE DAYTIME SLEEPINESS ASSOCIATED WITH NARCOLEPSY

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Introduction: Previous studies indicated that patients with narcolepsy often exhibit neuropsychological deficits. Cognitive domains related to alertness, attention, executive function, and decision-making are predominantly impaired. Solriamfetol (Sunosi®) is a dopamine/norepinephrine reuptake inhibitor and TAAR1 / 5HT1a agonist approved to treat excessive daytime sleepiness (EDS) associated with narcolepsy or obstructive sleep apnea (OSA). Solriamfetol has been shown to improve cognitive performance in a clinical study of OSA patients with cognitive impairment. Here we report neuropsychological outcomes of narcolepsy patients following treatment with solriamfetol in a real-world setting.
Methods: Neuropsychological outcomes were assessed in a subgroup of adult narcolepsy patients in a retrospective observational study (SURWEY), which collected data from physicians in Germany who prescribed solriamfetol for narcolepsy. The test of attentional performance (TAP, subtest "alertness"), Regensburger Word Fluency Test (RWT), Wechsler Memory Scale (WSM-IV, subtest "visual reproduction"), Wechsler Adult Intelligence Scale (WAIS-IV, subtest "coding"), and British Columbia Cognitive Complaints Inventory (BC-CCI) were conducted prior to and 3 months following solriamfetol initiation. Data were analyzed with analysis of variance (ANOVA) repeated measures. Unadjusted linear regression models were fit on change from baseline of each outcome. Adjusted models were fit to evaluate associations between cognitive and ESS changes from baseline.
Results: Prior to initiation of solriamfetol, patients (N=52) showed cognitive deficits in BC-CCI (9.1±5.6), impaired alertness in TAP (263.8±26.0 ms with warning signal and 265.5±26.0 ms without), and psychomotor and visual speed in the subset "coding" of WAIS-IV (6.8±1.6). After 3 months of solriamfetol treatment, assessment outcomes were compared to baseline values and BC-CCI improved by 39.4% (5.6±2.9), alertness increased by 10.5% (TAP: 236.0±17.7 ms with warning signal and 237.6.5±17.7 ms without), and the coding subtest improved by 34.3% (9.2±1.8). No reductions in word fluency or memory were observed prior to or 3 months following solriamfetol initiation. The ESS scores improved by 3.8±2.1. Reduction in EDS was not associated with improvement in any cognitive domain.
Conclusion: Data from this observational study demonstrates that solriamfetol has potential to improve cognitive function in patients with narcolepsy-associated cognitive impairment. This improvement was independent from its effect on EDS.
Support (if any): Axsome Therapeutics, Jazz Pharmaceuticals, Pharmanovia

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0635

MODAFINIL VS AMPHETAMINE-DEXTROAMPHETAMINE FOR IDIOPATHIC HYPERSOMNIA & NARCOLEPSY TYPE 2: A NON-INFERIORITY TRIAL

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Introduction: Despite recent introduction of several FDA-approved treatments for narcolepsy, clinical management of narcolepsy type 2 (NT2) and idiopathic hypersomnia (IH) still relies heavily on treatment with modafinil and amphetamines. While modafinil has a strong recommendation for use in these disorders by the American Academy of Sleep Medicine, clinical trial evidence regarding efficacy of amphetamines is scarce.
Methods: We performed a 12-week, randomized, fully-blinded, non-inferiority trial to determine if amphetamine-dextroamphetamine was non-inferior to modafinil in people with IH and NT2. Eligible participants were randomized 1:1 to modafinil (starting 100 mg once daily, titrating as tolerated to maximum 200 mg twice daily) or amphetamine-dextroamphetamine (starting 10 mg once daily, titrating as tolerated to maximum 20 mg twice daily). The primary outcome was Epworth change from baseline. Secondary outcomes included Patient Global Impression of Change (PGI-C, for overall severity, sleepiness, sleep inertia, cognitive symptoms), the Hypersomnia Severity Index (HSI), and the Sleep Inertia Questionnaire (SIQ). Outcomes were collected at baseline, weeks 4, 8, and 12, with last observation carried forward in the case of missing responses or dropouts.
Results: 44 participants were randomized and took at least one dose of medication (75% with IH, 84% women, mean age 35.4 +/- 8.9). Although change in Epworth scores was similar between the two medications (5.0 +/- 2.7 points improved for modafinil group, 4.4 +/- 4.7 for amphetamine-dextroamphetamine), non-inferiority of amphetamine-dextroamphetamine was not demonstrated. However, amphetamine-dextroamphetamine was shown to be non-inferior to modafinil for several secondary outcomes, including PGI-C for cognitive symptoms and sleep inertia, change in HSI, and change in SIQ. Participants experiencing at least one adverse event was similar between groups (77.3% for each medication); dropouts due to adverse events were numerically but not statistically higher in the modafinil group (32% for modafinil, 9% for amphetamine-dextroamphetamine, p=0.13).
Conclusion: Amphetamine-dextroamphetamine is non-inferior to modafinil across a variety of disease measures included as secondary outcomes, but may not be non-inferior for sleepiness as measured by the Epworth. Depending on patient symptoms, this study provides evidence in support of amphetamine-dextroamphetamine.
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0636

ASSESSING USABILITY OF ONCE-NIGHTLY SODIUM OXYBATE EXTENDED-RELEASE ORAL SUSPENSION FOR NARCOLEPSY

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Introduction: Sodium oxybate, available in once-nightly and twice-nightly formulations, is indicated for treatment of cataplexy or excessive daytime sleepiness in narcolepsy. Once-nightly sodium oxybate extended-release oral suspension (ON-SXB; LUMRYZ™) may alleviate potential dosing challenges associated with immediate-release twice-nightly formulations. Human factors validation testing was conducted to confirm safe use of ON-SXB, using the product packaging, mixing cup, and Instructions for Use (IFU).
Methods: Two summative studies evaluated simulated usability of ON-SXB in individuals (16–65 years of age) with narcolepsy, who were categorized as either experienced (having current or previous experience self-administering SXB) or naive (no current or previous experience). Both studies were conducted in lab settings modeled after a home bedroom environment. Study 1 (S1) assessed all critical and noncritical tasks related to storage, preparation, administration, and disposal of ON-SXB. After S1, IFU updates were implemented for additional risk control. Study 2 (S2) assessed tasks associated with these updates. Tasks were evaluated through observed performance or participant responses to a labeling comprehension activity.
Results: Of the S1 participants enrolled (mean [range] age, 37.0 [16–57] years; female, 77%), 77% (24/31) successfully prepared and administered the full ON-SXB dose. Critical use errors included failure to administer dose at bedside (experienced, 8/15; naive, 12/16) and preparing >1 dose packet (experienced, 1/15; naive, 1/16). Multiple critical use errors occurred during the label comprehension activity, which S1 participants attributed to difficulty in locating certain safety-critical warnings in the labeling. Using these data, the IFU was updated. In S2, 87% (26/30) of participants (mean [range] age, 35.8 [17–64] years; female, 83%) successfully prepared and administered the dose. Fewer S2 participants encountered critical errors observed in S1 (not administering dose at bedside [experienced, 4/15; naive, 5/15] and preparing >1 dose packet [none]), indicating that IFU updates effectively reduced the associated use risks. Only 2 use errors, which occurred with naive participants and were related to product storage, occurred in the S2 label comprehension activity.
Conclusion: Validation to confirm that individuals with narcolepsy can follow labeled instructions for safe use and self-administration of oxybates is important and has been conducted with ON-SXB.
Support (if any): Avadel Pharmaceuticals

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0637

COMPOSITE RESPONSE WITH ONCE-NIGHTLY SODIUM OXYBATE: SYMPTOM IMPROVEMENT IN PARTICIPANTS WITH NARCOLEPSY TYPE 1

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Introduction: A novel once-nightly formulation of sodium oxybate (ON-SXB; LUMRYZ™) was investigated in patients with narcolepsy type 1 (NT1) and 2 (NT2) in the phase 3 REST-ON trial (NCT02720744). ON-SXB treatment resulted in statistically significant improvements vs placebo for the coprimary endpoints of change from baseline in mean sleep latency on the Maintenance of Wakefulness test (MWT), Clinical Global

Impression-Improvement (CGI-I) rating, and number of weekly cataplexy attacks, as well as the secondary endpoint of improved excessive daytime sleepiness (EDS) using the Epworth Sleepiness Scale (ESS; all P< 0.001 vs placebo). The objective of this post hoc analysis was to assess the proportion of participants with NT1 achieving clinically significant improvement on a composite of these endpoints.

Methods: Participants (aged ≥16 years with NT1 or NT2) who had continuing presence of EDS (sleep latency < 11 min on the MWT and ESS score >10) and continuing cataplexy (average of 8 episodes/week) were randomized 1:1 to ON-SXB or placebo. Doses were 4.5 g week 1; 6 g weeks 2−3; 7.5 g weeks 4−8; and 9 g weeks 9−13. Clinically significant improvement thresholds per the 2021 American Academy of Sleep Medicine Clinical Practice Guidelines for each endpoint were defined as follows: MWT (2-min improvement), CGI-I (1-point improvement), cataplexy (25% decrease), or ESS (2-point improvement) and examined for each dose.

Results: Mean age of participants with NT1 was 32.1 years, 72.8% were female, and 76.5% were white. The modified intent-to-treat population included 145 participants with NT1 (ON-SXB, n=73; placebo, n=72). At week 13 (9 g), more participants treated with ON-SXB vs placebo had clinical improvement in ≥2 endpoints (87.3% vs 62.9%; P< 0.01), ≥3 endpoints (76.4% vs 43.5%; P< 0.001), and in all 4 endpoints (47.3% vs 14.5%; P< 0.001). Similar results were observed at all doses.

Conclusion: These data support the robust clinical efficacy of ON-SXB, a once-at-bedtime oxybate for treatment of cataplexy or EDS in adults with narcolepsy, using multiple disease state metrics compared with placebo.

Support (if any): Avadel Pharmaceuticals

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0638

STABILITY OF ONCE-NIGHTLY SODIUM OXYBATE IN ALTERNATIVE LIQUID RECONSTITUTION VEHICLES

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Introduction: LUMRYZ™ is a once-nightly formulation of sodium oxybate (ON-SXB) containing both immediate and pH-dependent controlled-release granules designed to be reconstituted in water and administered orally. This study was conducted to determine the dissolution profile of ON-SXB at prescribed doses after reconstitution in alternative liquids.

Methods: Dissolution and pH testing was conducted with ON-SXB 4.5-g and 9-g single-dose packs reconstituted in Milli-Q® water (control), Crystal Light© Raspberry Lemonade (CL), MiO© Fruit Punch Concentrate (Mio), and alkaline water (AW). CL and Mio were prepared with tap water. Dissolution (percent of label claim) was measured at 15 minutes and 1, 2, 2.5, 3, 3.5, 4, 5, 6, and 8 hours after 5-minute (AW only) and 30-minute (CL, Mio, and AW) rest periods. The pH of each reconstitution solution was measured prior to and then 5 and 30 minutes after addition of ON-SXB.

Results: After 15 minutes, ON-SXB 4.5 g was 50% dissolved in control, 51% in CL and Mio, and 49% in AW after both rest periods; at 8 hours, 98% was dissolved in control, 101% in CL and Mio, and 99% in AW after both rest periods. At 15 minutes, ON-SXB 9 g was 50% dissolved in control and CL, and 51% in Mio and AW after both rest periods; at 8 hours, 98% was dissolved in control, 101% in CL and Mio, and 97% in AW after the 5-minute rest period, and 98% in AW after the 30-minute rest period. Before addition of ON-SXB, the pH of control, CL, Mio, and AW was 7.03, 3.02, 2.95, and 9.53, respectively. For ON-SXB 4.5 g in control, CL, Mio, and AW, the pH was 5.6, 5.3, 5.4, and 5.6 at 5 minutes and 5.6, 5.2, 5.3, and 5.5 at 30 minutes, respectively. For ON-SXB 9 g in control, CL, Mio, and AW, the pH was 5.7, 5.5, 5.6, and 5.7 at 5 minutes and 5.7, 5.6, 5.6, and 5.7 at 30 minutes, respectively.

Conclusion: These results show consistent and acceptable dissolution of ON-SXB in various liquids, which may be preferred by some patients as alternatives to water.

Support (if any): Avadel Pharmaceuticals

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0639

LONG-TERM SAFETY AND TIMING OF ADVERSE EVENTS WITH LOW-SODIUM OXYBATE IN A PHASE 3 IDIOPATHIC HYPERSOMNIA STUDY

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Introduction: Low-sodium oxybate (LXB; Xywav®) is approved by the US Food and Drug Administration for the treatment of idiopathic hypersomnia in adults. To examine the long-term safety of LXB in this population, this post hoc analysis evaluated treatment-emergent adverse events (TEAEs) over time in a phase 3, double-blind, placebo-controlled, randomized withdrawal trial (NCT03533114), including its open-label extension period.

Methods: Participants were adults with idiopathic hypersomnia. TEAEs were analyzed across all study periods (open-label titration,10–14 weeks; stable-dose, 2 weeks; double-blind randomized withdrawal, 2 weeks; open-label extension, 24 weeks; safety follow-up, 2 weeks) in the analysis population (oxybate-naive participants who took ≥1 dose of study drug; N=148). Onset and duration of common TEAEs (≥5% of participants) were reported in the total population and by baseline medication group (treatment-naive, n=66; taking alerting agents [stimulants or wake-promoting agents], n=82). Duration was defined as the time from when a TEAE started until it was reported as ended. Results are presented using descriptive statistics.

Results: The majority of the most frequently reported TEAEs occurred within the first 5 weeks after study onset. In treatment-naive participants, the most common TEAEs (incidence; median duration) were nausea (n=13 [19.7%]; 7.5 days), headache (n=12 [18.2%]; 3.0 days), dizziness (n=11 [16.7%]; 4.0 days), anxiety (n=7 [10.6%]; 9.0 days), and decreased appetite (n=7 [10.6%]; 15.0 days). In participants taking alerting agents, the most common TEAEs were nausea (n=21 [25.6%]; 7.5 days), headache (n=15 [18.3%]; 2.0 days), vomiting (n=14 [17.1%]; 1.5 days), anxiety (n=10 [12.2%]; 28.0 days), insomnia (n=9 [11.0%]; 7.0 days), and tremor (n=9 [11.0%]; 11.0 days). Common TEAEs were of mild or moderate severity and infrequently led to study discontinuation (≤3.7% of participants each). Nine serious TEAEs occurred in 4/148 (2.7%)

participants; none were considered related to study drug or led to study discontinuation.
Conclusion: In this study of LXB in participants with idiopathic hypersomnia, the common TEAEs (≥5% of participants) were consistent with the known safety profile of oxybate, peaked early (generally within 5 weeks), and were mild to moderate in severity, in both treatment-naive participants and participants taking alerting agents.
Support (if any): Jazz Pharmaceuticals

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0640

MAGNITUDE OF IMPROVEMENT IN EXCESSIVE DAYTIME SLEEPINESS WITH THE ONCE-AT-BEDTIME OXYBATE FOR NARCOLEPSY

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Introduction: Safety and efficacy of once-nightly sodium oxybate (ON-SXB; LUMRYZ™) were investigated in the phase 3 REST-ON trial (NCT02720744). Results demonstrated statistically significant improvements in the secondary endpoint of excessive daytime sleepiness (EDS) measured using the Epworth Sleepiness Scale (ESS; P< 0.001 vs placebo) at all doses tested beginning at week 2 (post hoc analysis, ON-SXB 6 g vs placebo at week 2). The objective of this post hoc analysis was to assess the magnitude of improvement in the patient-reported outcome of EDS following treatment with ON-SXB.
Methods: Participants aged ≥16 years with narcolepsy type 1 (NT1) or 2 (NT2) were randomized 1:1 to ON-SXB or placebo. Doses were 4.5 g week 1; 6 g weeks 2−3; 7.5 g weeks 4−8; and 9 g weeks 9−13. Median (interquartile range [IQR]) ESS scores were assessed for each dosing period.
Results: Mean age of participants was 31.2 years, 68% were female, 75.5% were white, and 76.4% had NT1. The modified intent-to-treat population included 190 participants (ON-SXB, n=97; placebo, n=93). Baseline median (IQR) ESS scores were 17 (14−19) for ON-SXB and 18 (15−21) for placebo. At week 1, median (IQR) ESS scores were 16 (12−18) for ON-SXB 4.5 g vs 17 (13−20) for placebo. At week 3 (ON-SXB 6 g), median (IQR) ESS scores were 14 (10−18) vs 17 (14−20) for placebo. At week 8 (ON-SXB 7.5 g), median (IQR) ESS scores were 12 (8−16) vs 15.5 (12−20) for placebo. At week 13, median (IQR) ESS scores for ON-SXB 9.0 g were 9.5 (6.0−15.0) vs 15 (11−19) for placebo.
Conclusion: Treatment with ON-SXB resulted in clinically meaningful improvements in EDS with doses ≥6 g, as median ESS scores were within the range considered normal (≤10) at the end of the trial. ON-SXB is considered an effective intervention in treatment of EDS for patients with narcolepsy with a once-at-bedtime dose.
Support (if any): Avadel Pharmaceuticals

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0641

POPULATION PHARMACOKINETIC AND EXPOSURE-RESPONSE ANALYSES SUPPORTING INDIVIDUALIZED DOSING OF OXYBATE

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Introduction: Low-sodium oxybate (LXB; Xywav®) and high-sodium oxybate (SXB; Xyrem®) are approved for the treatment of cataplexy or excessive daytime sleepiness in patients aged ≥7 years with narcolepsy; LXB is also approved for idiopathic hypersomnia in adults. LXB and SXB dosing are individually titrated for optimal efficacy/tolerability. To inform dosing individualization, population pharmacokinetic (PPK) and exposure-response (ER) analyses were conducted to identify factors influencing oxybate PK variability and assess relationships between exposure and efficacy/safety.
Methods: For narcolepsy, a 2-compartment PPK model with Michaelis-Menten clearance was fit to plasma concentration-time data from prior LXB and SXB clinical studies. For idiopathic hypersomnia, an LXB PPK model was refined based on the narcolepsy model. The PPK model-derived oxybate exposures (eg, AUC) were employed in ER analyses using response data from randomized parallel-group (RPG; SXB only; maintenance dose was not optimized) and randomized withdrawal (RWD; LXB and SXB; maintenance dose was optimized) studies.
Results: In the narcolepsy PPK model, the interindividual variabilities associated with key clearance and absorption parameters were 42.9%–83.8%, and in the idiopathic hypersomnia PPK model, the interindividual variabilities were 52.7%–57.9%. In both PPK models, food delayed oxybate absorption; greater body weight was associated with wider distribution and higher clearance. In ER analyses from RPG narcolepsy studies, all efficacy endpoints (eg, placebo- and baseline-corrected cataplexy frequency and Epworth Sleepiness Scale [ESS] score) exhibited improvements (ie, decreases) that had a significant relationship with higher oxybate exposure (AUC); no other covariates (eg, age, race, sex, body weight) were significant. In RWD studies, ER relationships for cataplexy change (narcolepsy only) and ESS score (narcolepsy and idiopathic hypersomnia) were flat, indicating that there is a range of effective concentrations and that different patients require different doses to achieve an optimal response. Adverse events associated with oxybate exposure included nausea, vomiting, and enuresis.
Conclusion: PPK analyses identified substantial interpatient variability of oxybate PK, and ER analyses demonstrated interindividual variability in response to oxybate treatment. Together, these modeling analyses highlight the need for individually optimized oxybate dosing in narcolepsy or idiopathic hypersomnia to achieve the appropriate dose and associated exposure for an optimal clinical response.
Support (if any): Jazz Pharmaceuticals

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0642

REAL-WORLD EXPERIENCE SWITCHING FROM TWICE NIGHTLY TO ONCE NIGHTLY OXYBATE THERAPY IN THE TREATMENT OF NARCOLEPSY

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Introduction: Narcolepsy is a chronic neurologic condition of excessive daytime sleepiness (EDS), disturbed nocturnal sleep,

and REM dissociation. In 2002, Xyrem (sodium oxybate) was approved by the U.S Food and Drug Administration (FDA) for treatment of EDS and cataplexy in narcolepsy. In 2023, the FDA approved Lumryz, a once-nighty sodium oxybate, citing its major contribution to patient care "due to its once nightly dosing because, in treating a sleep disorder, it is best to eliminate or minimize nocturnal arousals." However, little information exists on the real-world experience of switching patients from an established twice-nightly agent to Lumryz.

Methods: In a large narcolepsy practice in Sugar Land, TX, patients were given the option to switch from their current twice nightly oxybate (Xywav or Xyrem) to Lumryz. Age, current therapy, reason for switching, dose difference, and tolerance were extracted from the medical record.

Results: Twenty-one patients elected to switch: 18 female and 3 male, mean age of 31.2 years with 10 of the patients taking Xywav. The most common reason (38%) for wanting to switch was inability to wake up for the second dose. Of the 21 patients that switched, 20 had follow-up after a change in oxybate product. Of those 20, 16 (80%) preferred the new once-nightly agent. The most common reason for failure was shorter total sleep time with Lumryz with increasing EDS.

Conclusion: In this real-world experience of switching patients from twice-nightly to once-nightly oxybate, the majority of those who elected to switch were successful and remained on Lumryz.

Support (if any):

Abstract citation ID: zsae067.0643

0643

PATIENT PREFERENCES OF SODIUM OXYBATE TREATMENT FOR NARCOLEPSY: RESTORE END-OF-STUDY SURVEY DATA

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Introduction: Until recently, the only available oxybate therapy options were immediate-release (IR) formulations requiring patients to awaken 2.5 to 4 hours after their first dose to take a second dose. Once-nightly sodium oxybate (ON-SXB; LUMRYZ™) is an extended-release formulation of sodium oxybate that eliminates the need for a middle-of-the-night dose. RESTORE (NCT04451668) was an open-label/switch study that evaluated the safety and tolerability of ON-SXB and surveyed patient preferences for ON-SXB or IR oxybate therapies.

Methods: Participants were ≥16 years of age with narcolepsy type 1 or 2 who either completed the phase 3 REST-ON trial and were on stable doses of IR oxybate for ≥1 month or oxybate naive. Participants completed end-of-study (EOS) questionnaires to capture their experience with ON-SXB.

Results: As of November 2023, EOS questionnaire data were available for 89 participants, including 21 participants who completed REST-ON or were oxybate naive and 68 participants who switched from IR oxybate to ON-SXB. In total, 71% (63/89) of responders rated their narcolepsy "much better" or "somewhat better" after initiating ON-SXB. After starting ON-SXB, 75% (67/89) were very satisfied with ON-SXB compared to other treatments they had taken, and 89% (79/89) would recommend ON-SXB to a family member or friend with narcolepsy. Approximately 69% (61/89) of participants found it easier to go through the day without falling asleep, 91% (81/89) were better able to sleep through the night, 64% (57/89) were able to get more done at work or school, and 64% (57/89) were better able to socialize with friends or family. Additionally, 43% (38/89) of responders were able to perform or better perform certain daily activities. Of the participants who switched from IR oxybate to ON-SXB, 91% (62/68) were better able to follow the recommended dosing schedule of ON-SXB.

Conclusion: These EOS RESTORE data show a high level of satisfaction with ON-SXB, improved symptom control, and a preference for ON-SXB over other treatment options. A majority switching from IR oxybate treatment reported improvement in dosing as directed.

Support (if any): Avadel Pharmaceuticals

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0644

COMPARISON OF BASELINE NARCOLEPSY CHARACTERISTICS AMONG PARTICIPANT AGE GROUPS: ANALYSIS FROM REST-ON

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Introduction: Narcolepsy is a chronic disease with symptom onset frequently occurring between the ages of 10–25 years. Efficacy and safety of once-nightly sodium oxybate (ON-SXB; LUMRYZ™) were demonstrated in the phase 3 REST-ON trial. The objective of this post hoc analysis was to compare baseline narcolepsy characteristics among 3 age groups from REST-ON.

Methods: Participants aged ≥16 years with narcolepsy type 1/2 were enrolled in the randomized, double-blind, placebo-controlled REST-ON trial (NCT02720744). Baseline data were trichotomized post hoc by age subgroups (years, youngest: 16–25; middle: 26–34; oldest: 35–72).

Results: The safety analysis included 212 participants who received ≥1 dose of study drug (youngest, n=73; middle, n=70; oldest, n=69). For youngest, middle, and oldest participants, respectively, mean age was 20.6, 29.6, and 44.0 years; 63.0%, 68.6%, and 72.5%, were female. Respective mean baseline values for excessive daytime sleepiness (EDS) measures were similar across the youngest, middle, and oldest age groups (range of group means, mean sleep latency on the Maintenance of Wakefulness Test: 4.5–5.1, 4.6–5.0, 4.9–5.1 minutes; Clinical Global Impression of Severity for sleepiness rating: 4.8–5.3, 5.1–5.3, 5.1 [both treatment arms]; Epworth Sleepiness Scale score: 16.7–16.9, 15.2–17.9, 17.6–18.1). For objective disrupted nighttime sleep (DNS) measures determined by polysomnography, the middle group (range of group means, 58.1–68.2) and oldest group (63.4–66.3) had more sleep stage shifts to lighter stage of sleep/wake compared to the youngest group (50.5–56.3). The oldest group experienced a higher number of nocturnal arousals (range of group means, 83.5–87.2) compared to the middle (77.6–83.2) and youngest groups (65.4–80.7). Subjective DNS measures were similar across age

groups (range of group means, visual analog scale [VAS] sleep quality, 1=did not sleep/100=slept very well: 48.3–60.7; VAS refreshing nature of sleep, 1=not refreshed/100=refreshed: 44.2–53.2).
Conclusion: Baseline measures of EDS were similar among age groups of participants with narcolepsy in the REST-ON trial. Objective but not subjective DNS measures were worse in older participants, suggesting DNS may increase with age.
Support (if any): Avadel Pharmaceuticals

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0645

COMPARISON OF DEMOGRAPHICS AND BASELINE NARCOLEPSY SYMPTOMS BETWEEN PARTICIPANTS WITH NT1 AND NT2 FROM REST-ON

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Introduction: Narcolepsy is classified into 2 subtypes: narcolepsy type 1 (NT1; with cataplexy) and 2 (NT2; without cataplexy). Limited data are available regarding subtype differences in clinical characteristics and disease severity. In the phase 3 REST-ON trial, once-nightly sodium oxybate (ON-SXB; LUMRYZ™) demonstrated significant improvement in the 3 coprimary endpoints of change from baseline in mean sleep latency on the Maintenance of Wakefulness test (MWT), Clinical Global Impression of Improvement rating, and weekly cataplexy episodes (all P< 0.001) in patients with NT1 and NT2. This post hoc analysis compared baseline characteristics between participants with NT1 and NT2.
Methods: REST-ON (NCT02720744) participants were ≥16 years of age with NT1 or NT2, excessive daytime sleepiness, and cataplexy (NT1 only). Use of alerting agents was permitted. Randomization (1:1 to ON-SXB or placebo) was stratified by narcolepsy type; the trial population was oversampled for NT1. Baseline characteristics were compared between narcolepsy types.
Results: The safety population included 212 participants (NT1, n=162; NT2, n=50). At baseline, demographic characteristics of participants with NT1 vs NT2 were: mean (SD) age, 32.1 (11.1) vs 28.3 (10.0) years, respectively; sex, 72.8% vs 52.0% female; body mass index, 28.9 (7.5) vs 25.7 (5.6) kg/m2; and use of concurrent alerting agents, 59.2% vs 68.0%. Mean (SD) baseline clinical characteristics in participants with NT1 vs NT2 were: mean sleep latency (MWT), 4.9 (2.9) vs 4.9 (2.9) minutes; Clinical Global Impression rating (CGI-Severity), 5.2 (1.1) vs 4.7 (1.1); ESS scores, 17.6 (4.0) vs 15.4 (3.2); number of sleep stage shifts to lighter stage of sleep or wake measured by polysomnography (PSG), 61.5 (22.2) vs 55.8 (23.5); number of nocturnal arousals by PSG, 81.5 (42.4) vs 73.2 (35.9); sleep quality (visual analog scale [VAS; 1 = did not sleep and 100 = slept very well]), 54.5 (22.0) vs 55.8 (20.8); and refreshing nature of sleep (VAS; 1 = not refreshed and 100 = refreshed), 49.9 (22.6) vs 42.6 (21.6).
Conclusion: Limited data are available comparing NT1 and NT2 populations; these data indicate a similar level of disease severity at baseline.
Support (if any): Avadel Pharmaceuticals

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0646

EFFICACY OUTCOMES AMONG MALE AND FEMALE PARTICIPANT SUBGROUPS: A POST HOC ANALYSIS FROM REST-ON

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Introduction: Once-nightly sodium oxybate (ON-SXB; LUMRYZ™) is an effective and safe treatment for excessive daytime sleepiness (EDS) and cataplexy in adults with narcolepsy. This post hoc analysis assessed efficacy in female and male participant subgroups from the phase 3 REST-ON trial.
Methods: REST-ON (NCT02720744) participants (≥16 years) with narcolepsy type 1 (NT1) or NT2 were randomized (1:1) to receive ON-SXB at 4.5 g (week 1), 6 g (weeks 2–3), 7.5 g (weeks 4–8), and 9 g (weeks 9–13) or placebo. Data shown are least squares mean changes from baseline (SE) in mean sleep latency on the Maintenance of Wakefulness Test (MWT) and weekly number of cataplexy episodes (NCA; NT1 only) calculated at week 13 (9 g) in the modified intent-to-treat (mITT) population (ie, randomized participants with ≥1 efficacy measurement post 6-g dose).
Results: The mITT population included more female (ON-SXB, n=60; placebo, n=65) than male (ON-SXB, n=37; placebo, n=28) participants. Baseline mean sleep latency (SD) on the MWT (min) was 5.24 (3.41) and 4.59 (2.65) for female and male participants in the ON-SXB arm, respectively. At week 13, improvements on the MWT with ON-SXB were greater for female than for male participants (11.62 [1.39], 9.52 [1.26]). Baseline mean weekly NCA (SD) was 19.63 (9.0) and 17.48 (8.03) for female and male participants, respectively, in the ON-SXB arm. Improvements in weekly NCA with ON-SXB were similar for female and male participants at week 13 (–11.80 [1.23], –11.31 [1.62]).
Conclusion: These post-hoc subgroup data demonstrate improvement with ON-SXB in EDS and in cataplexy for people with narcolepsy regardless of gender.
Support (if any): Avadel Pharmaceuticals

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0647

EFFICACY OF LOW-SODIUM OXYBATE IN NARCOLEPSY PATIENTS WITH AND WITHOUT CARDIOVASCULAR OR CARDIOMETABOLIC DISORDERS

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Introduction: Low-sodium oxybate (LXB; Xywav®) is approved by the US Food and Drug Administration to treat excessive daytime sleepiness or cataplexy in patients ≥7 years of age with narcolepsy, and idiopathic hypersomnia in adults. LXB contains the same active moiety as high-sodium oxybates (sodium oxybate [SXB, Xyrem®] and fixed-dose SXB [Lumryz™]) but with 92% less sodium. Previous studies have reported increased cardiovascular (CV) and cardiometabolic (CM) comorbidities in people with narcolepsy. This post-hoc analysis of a phase 3 trial assessed LXB efficacy and safety in participants with narcolepsy with and without CV/CM comorbidities.
Methods: Participants 18–70 years of age with narcolepsy with cataplexy optimized/titrated their LXB dose (up to 12 weeks) before entering a 2-week stable-dose period (SDP) (NCT03030599). Following SDP, participants withdrew to placebo or continued LXB during a 2-week double-blind randomized-withdrawal period (DBRWP). Epworth Sleepiness Scale (ESS) scores, cataplexy (average N/week), Patient Global Impression of Change (PGIc) scores, and treatment-emergent adverse events (TEAEs) were assessed in participants with and without CV/CM comorbidities, per medical history.
Results: Of 201 participants, 69 reported CV/CM comorbidities at baseline (most commonly hypertension and obesity). Participants with and without CV/CM comorbidities, respectively, had mean (SD) BMI of 31.6 (6.4) and 27.2 (5.3); mean age was 43.4 (12.0) and 33.9 (11.0) years; 66.7% and 57.6% were female. Participants randomized to placebo in the DBRWP in both subgroups showed worsening (increases) in ESS scores compared with those randomized to LXB (least squares mean differences, LXB vs placebo [95% CI], with CV/CM comorbidities: −2.6 [−4.5, −0.70], P=0.0077; without CV/CM comorbidities: −2.7 [−4.2, −1.2], P=0.0004; subgroup interaction, P=0.95). Participants without CV/CM comorbidities randomized to placebo had increased cataplexy attacks compared with those taking LXB (median, placebo, 3.0; LXB, 0.0; P< 0.0001); those with CV/CM comorbidities had similar efficacy (placebo, 1.9; LXB, 0.0; P=0.0745). PGIc scores showed worsening in participants randomized to placebo vs LXB in both subgroups (P< 0.0001 for both). Serious TEAEs were reported by 3% of participants with CV/CM comorbidities and 2% of those without.
Conclusion: In this post-hoc analysis, the efficacy and safety of LXB were similar in participants with narcolepsy with and without CV/CM comorbidities.
Support (if any): Jazz Pharmaceuticals

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0648

PHASE 3 RANDOMIZED PLACEBO-CONTROLLED TRIAL OF PITOLISANT FOR EXCESSIVE DAYTIME SLEEPINESS IN PRADER-WILLI SYNDROME

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Introduction: Prader-Willi syndrome (PWS) is a genetic, neurodevelopmental disorder characterized by global hypothalamic dysfunction that results in a variety of symptoms including behavioral disturbance, hyperphagia, and excessive daytime sleepiness (EDS). Pitolisant is approved for the treatment of EDS or cataplexy in adults with narcolepsy. In a phase 2, proof-of-concept study, pitolisant showed trends of reduction in EDS relative to placebo in patients with PWS.
Methods: This multicenter, randomized, double-blind, placebo-controlled, phase 3 study will evaluate the efficacy and safety of pitolisant in patients with PWS. The study will enroll patients ≥6 years of age with a genetically confirmed diagnosis of PWS, and have EDS as confirmed by the investigator. Selected exclusion criteria include patients with symptoms or diagnosis of psychosis or schizophrenia, inadequately treated sleep disordered breathing, and moderate or severe hepatic or renal impairment. Eligible patients will be randomly assigned (1:1) to receive pitolisant (weight-based dosing: 8.9-44.5 mg/d) or matching placebo tablets. The 11-week double-blind period will be followed by an optional 52-week open-label extension.
Results: Up to 100 patients per group will be enrolled. The primary endpoint will be change from baseline at Week 11 in EDS as measured by the PROMIS-SRI (Patient-Reported Outcomes Measurement Information System - Sleep Related Impairment [Parent Proxy]). The secondary endpoints will include behavioral disturbance as measured by the Aberrant Behavior Checklist-Community domains (irritability, social withdrawal, stereotypic behavior, hyperactive/noncompliance, and inappropriate speech), Caregiver Impression of Severity for EDS, Clinician Global Impression of Severity for EDS, Epworth Sleepiness Scale for Children and Adolescents, and the Hyperphagia Questionnaire for Clinical Trials in conjunction with the Food Safe Zone Questionnaire. Safety assessments will include incidence and severity of adverse events, clinical laboratory tests, vital signs, and 12-lead ECG. The study is expected to start enrolling patients in 2024.
Conclusion: This study is designed to determine whether pitolisant is efficacious in the treatment of EDS in patients with Prader-Willi syndrome and to further characterize its safety profile in this patient population.
Support (if any): Harmony Biosciences, LLC

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0649

SAMELISANT IMPROVES THE SYMPTOMS OF EXCESSIVE DAYTIME SLEEPINESS IN NARCOLEPSY: RESULTS FROM A PHASE-2 STUDY

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Introduction: Narcolepsy is a lifelong sleep disorder characterized by a classic tetrad of excessive daytime sleepiness (EDS) with irresistible sleep attacks, cataplexy, hypnagogic hallucination, and sleep paralysis. The currently available treatments suffer from major limitations like side effects, modest efficacy or they must be prescribed in combination. Samelisant (SUVN-G3031) is a potent and selective histamine 3 receptor inverse agonist. In

orexin knockout mice, samelisant produced wake-promoting and anticataplectic effects suggesting its potential therapeutic utility in the treatment of narcolepsy. Safety and tolerability studies in animals and healthy human volunteers suggest a favorable risk/benefit profile for samelisant.
Methods: Samelisant had been evaluated as monotherapy in a Phase-2 proof of concept study in the USA and Canada for the treatment of EDS in patients with narcolepsy (ClinicalTrials.gov Identifier: NCT04072380). Patients diagnosed with narcolepsy as per ICSD-3 criteria, aged between 18 to 65 years with an Epworth Sleepiness Scale (ESS) score of ≥12 and mean Maintenance of Wakefulness Test (MWT) time of < 12 min were recruited in the study. A total of 190 patients were randomized into 3 treatment arms (placebo, samelisant 2 mg and samelisant 4 mg) in 1:1:1 ratio and received either placebo or samelisant, once daily for 2 weeks. The primary efficacy endpoint was change in ESS score from baseline to Day 14. Secondary endpoints were changes from baseline to week 2 in Clinical Global Impression - Severity (CGI-S) and MWT scores. The medical monitor and the data safety monitoring committee monitored safety throughout the study.
Results: The baseline characteristics and demographics were consistent with the general narcolepsy population and equally distributed between treatment groups. The study met the pre-specified primary efficacy endpoint. In comparison against placebo, samelisant as monotherapy demonstrated statistically significant (p< 0.024) and clinically meaningful reduction (-2.1 point) in EDS measured by ESS. Samelisant was generally safe and well tolerated.
Conclusion: Samelisant holds promise as a monotherapy treatment of EDS in narcolepsy.
Support (if any):

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0650

SAFETY AND EFFICACY OF KP1077 IN A PHASE 2, DOUBLE-BLIND, RANDOMIZED TRIAL IN PATIENTS WITH IDIOPATHIC HYPERSOMNIA

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Introduction: KP1077 is under development as an oral medication for the treatment of rare sleep disorders with Excessive Daytime Sleepiness (EDS), including idiopathic hypersomnia (IH). The active ingredient in KP1077 is serdexmethylphenidate (SDX), a prodrug of d-methylphenidate. The objectives of the study were to assess the safety (primary endpoint) and efficacy of KP1077 in patients with IH.
Methods: Adult patients with IH began KP1077 treatment in a 5-week open-label (OL) titration period. Possible dose levels were 80, 160, 240 and 320 mg/day SDX. Patients were randomized to receive their daily dose either once per day (just before going to sleep), or twice per day (half the daily dose just before going to sleep and half shortly after awakening). After the titration period, patients in each treatment group were randomized to placebo or continued KP1077 (optimized dose) during a 2-week double-blind (DB) withdrawal period. Assessments of safety were based on adverse events (AEs), physical examinations, clinical laboratory tests, vital signs, electrocardiograms, sleep quality, and suicidal ideation. Efficacy assessments included the Epworth Sleepiness Scale (ESS) and Idiopathic Hypersomnia Severity Scale (IHSS). Patients rated their difficulty of waking up in the morning with the Sleep Inertia Visual Analog Scale (SI-VAS) and brain fog throughout the day with an exploratory Brain Fog Scale (BFS).
Results: Safety and efficacy in the OL titration phase were evaluated in an interim analysis when 22 patients completed the study (target: ≥48 completers). KP1077 was well-tolerated for both treatments and all dose levels, with most frequent AEs of insomnia, headache, and nausea. Most AEs were mild, not leading to early discontinuation. Meaningful clinical improvements in scores of ESS, IHSS, SI-VAS, and BFS were observed in both treatment groups. Mean total ESS scores decreased by >9 points after 5 weeks of OL treatment. Results from all patients in the both the OL titration and DB withdrawal periods will be presented.
Conclusion: KP1077 was well-tolerated in patients with IH with AEs typical for a central nervous system stimulant. Meaningful clinical improvements of EDS, sleep inertia and brain fog were observed after 5 weeks of OL KP1077.
Support (if any): Zevra Therapeutics

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0651

PHARMACOKINETICS OF MORNING AND NIGHTTIME DOSES OF KP1077, AN INVESTIGATIONAL TREATMENT FOR IDIOPATHIC HYPERSOMNIA

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Introduction: KP1077 is under development as an oral medication for the treatment of rare sleep disorders with Excessive Daytime Sleepiness (EDS), including idiopathic hypersomnia (IH). The active ingredient in KP1077 is serdexmethylphenidate (SDX), a prodrug of d-methylphenidate (d-MPH). SDX is converted to d-MPH in the lower intestinal tract, with a delay and kinetics leading to a unique pharmacokinetic (PK) profile and an extended duration product. The objectives of the study were to assess the PK and safety after single morning and nighttime doses in healthy volunteers.
Methods: Heathy adult subjects received single oral doses of 240 mg SDX, either in the morning or at night, just before bedtime, in a randomized fashion with a washout of 6 days between treatments. Multiple blood PK samples and safety parameters were collected after each administration.
Results: A total of 15 subjects (9 males/6 females) were randomized with 14 completing both treatments. Both treatments were well-tolerated with adverse events typical for d-MPH. After the morning dose, d-MPH exposure was characterized by little or no d-MPH exposure for the first 4 hours followed by a gradual rise up to ~7 hour post-dose (Tmax), followed by a gradual decline. The rise in d-MPH concentrations after the nighttime dose was even more gradual than after the morning dose, with substantial levels reached around 10 hours postdose and a statistically significantly longer Tmax of 15 hours. Mean d-MPH peak concentrations were lower after the evening dose (22.0 ng/mL) compared to the morning dose (26.8 ng/mL) while total exposures (AUCinf) were similar (594 and 557 h*ng/mL, respectively).
Conclusion: Peak exposure of SDX-derived d-MPH and the bulk of the total d-MPH exposure after a nighttime dose of SDX occurs during the next morning compared to a morning dose where most exposure occurs the same day. This difference is likely due to a longer intestinal transit time and lower intestinal

activity during the nighttime sleeping hours. This delay supports nighttime dosing of SDX in patients with IH who suffer from EDS and Sleep Inertia (difficulty waking up in the morning).
Support (if any): Zevra Therapeutics

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0652

ABNORMAL SLEEP SLOW WAVE MORPHOLOGY IN IDIOPATHIC HYPERSOMNIA

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Introduction: Abnormal cortical synchronization during sleep could affect the restorative function of sleep and consequently, increase daytime sleepiness. Slow wave (SW) density and characteristics provide a unique window of how cortical neurons synchronize during non-rapid eye movement (NREM) sleep. Here, we aimed at verifying whether NREM sleep SW density and characteristics differed between patients with idiopathic hypersomnia (IH) and healthy controls.
Methods: 56 participants (38.18 ± 11.21 years old; 53% women) with diagnosed IH (full night of in-laboratory polysomnography followed by a multiple sleep latency test; MSLT) were compared to 128 healthy controls (38.16 ± 14.02 years old; 59% women) studied at our center and matched for age and sex. Exclusion criteria were apnea-hypopnea index ≥15, psychiatric conditions, neurological disorders, other sleep disorders, shift work, and use of psychoactive medications before the PSG. SW were automatically detected on C3 and C4 electrodes in N2 and N3 sleep stages. Group X Sleep cycle ANOVAs were used for SW density and characteristics (e.g., duration, amplitude, and slope, averaged for C3 and C4). Age was added as a control variable in all analyses. Statistical significance was set at $p < 0.05$.
Results: Several group effects were found where, compared to healthy controls, IH patients had significantly smaller slow wave negative amplitudes, peak-to-peak amplitudes, and smoother slopes ($p < 0.05$). The only significant interaction was for slow wave negative amplitudes, where the sleep cycle effect observed in healthy controls was not found in IH patients ($p < 0.05$).
Conclusion: Compared to healthy controls, IH patients have slow wave characteristics that suggest a lower cortical synchrony during NREM sleep and could explain the non-restorative effect of sleep often reported by these patients.
Support (if any): This project was made possible by an award from the American Academy of Sleep Medicine Foundation, a foundation of the American Academy of Sleep Medicine. Nadia Gosselin hold the Canada Research Chair in sleep disorders and brain health.

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0653

CAREGIVER PREFERENCES FOR NARCOLEPSY TREATMENT: A DISCRETE CHOICE EXPERIMENT

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Introduction: Once-nightly sodium oxybate extended-release oral suspension (ON-SXB; LUMRYZ™) is approved to treat excessive daytime sleepiness and cataplexy in adults with narcolepsy. Currently, a once-nightly oxybate option is not available for pediatric patients with narcolepsy. A discrete choice experiment was conducted among caregivers of pediatric patients with narcolepsy to determine drivers of preferences for oxybate therapy.
Methods: Thirty-minute web-based surveys were provided to adult caregivers of a pediatric (< 18 years old) patient with narcolepsy and prior or current use of twice-nightly SXB. Participants were recruited online or via patient advocacy groups. Two hypothetical product profiles with attributes of twice-nightly SXB and ON-SXB were created for 10 choice sets. For each choice set, participants indicated their preferred product overall, the product they would be more adherent to, and the product that would result in less anxiety or stress for the patient when thinking about taking the medication. A hierarchical Bayesian model was used to analyze the results.
Results: Caregivers (n=75) of pediatric patients with narcolepsy participated; 88% of patients cared for were age 10–15 years, 80% of caregivers had a household income of $60,000–$120,000, and 96% of patients currently used twice-nightly SXB. Caregivers indicated that the most important attribute driving overall product choice was dosing frequency (relative attribute importance [RAI], 23.7), with once-nightly preferred over twice-nightly dosing (relative preference weight [RPW], ±45.1), followed by treatment efficacy at the highest dose (RAI, 21.7). The most important attribute driving adherence was the efficacy of the drug at the highest dose (RAI, 25.7), followed by dosing frequency (RAI, 21.6), with once-nightly preferred over twice-nightly dosing (RPW, ±31.3). The most important attributes associated with less anxiety/stress were efficacy of the drug at the highest dose (RAI, 24.6) and side effects (RAI, 18.7).
Conclusion: Among caregivers of pediatric patients with narcolepsy, efficacy and dosing frequency were identified as the most important attributes driving preference for overall treatment choice and adherence; efficacy and side effects were important for reducing patient anxiety/stress. If approved by the US FDA for pediatric patients, ON-SXB will eliminate the chronic, middle-of-the night disruption impacting patients and caregivers.
Support (if any): Avadel Pharmaceuticals.

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0654

LONGITUDINAL SYMPTOMS OF IDIOPATHIC HYPERSOMNIA IN THE HYPERSOMNIA FOUNDATION REGISTRY

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Introduction: Idiopathic hypersomnia (IH) is a chronic neurologic disorder characterized by excessive daytime sleepiness; difficulty awakening, long sleep durations, and cognitive symptoms are variably present. Although spontaneous remission has been reported, little is known about IH's natural history. We characterized longitudinal changes in a large registry of people with IH.
Methods: Data were collected via the Hypersomnia Foundation's registry at CoRDS from 6/2016 through 8/2023. Participants were considered to have IH if they selected IH from a dropdown diagnosis menu, had a current diagnosis of IH or were told by a doctor that IH explained their symptoms, and reported at least 7 hours sleep/night. Participants who met these criteria and completed the questionnaire at least twice over at least 6 months were included in analyses. Responses from each participant's earliest and latest entries were compared, via paired t-test for continuous variables and McNemar test for categorical.
Results: Three hundred twenty-three participants with IH (mean age 35.0 +/-SD 12.2; 86.5% women) had an average time between first and last response of 2.4 (+/-1.4) years. Most participants (79.5%) were on IH medications at both timepoints; 5.6% started and 6.5% stopped IH treatment between timepoints. The most used medications at both timepoints were modafinil (21.7%), amphetamine-dextroamphetamine (19.8%), methylphenidate (17.7%), and armodafinil (13.6%). The only medication for which there was a significant usage change over time was modafinil, decreasing from 33.0% to 25.1%, p = 0.0005. Between the two time points, there was no change in proportion endorsing daily excessive sleepiness, long sleep durations, intentional or unintentional naps, requiring multiple alarms, or brain fog, but there was slight improvement in difficulty awakening (78.7% to 73.0%, p=0.01) and slight worsening of automatic behaviors (9.9% to 12.8%, p = 0.05). The most endorsed daily symptoms at final assessment were difficulty awakening (73.0%), excessive sleepiness (61.8%), requiring multiple alarms (55.3%), brain fog (48.4%), and poor memory (43.4%).
Conclusion: Over 2½ years, symptoms of IH remained largely stable. While this may suggest a lack of progression over time, the high proportion of residual symptoms also suggests a failure of current treatments to achieve comprehensive symptom control.
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0655

NOVEL DESIGN ELEMENTS TO EVALUATE SLEEP ARCHITECTURE AND OUTCOMES IN AN IDIOPATHIC HYPERSOMNIA AND NARCOLEPSY STUDY

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Introduction: Although the efficacy and safety of low-sodium oxybate (LXB, Xywav®) in the treatment of idiopathic hypersomnia and narcolepsy are well established, opportunities remain to better understand its impact on sleep architecture and other daytime/nighttime outcomes important to patients and clinicians. Jazz DUET (Develop hypersomnia Understanding by Evaluating low-sodium oxybate Treatment; NCT05875974) is a phase 4, prospective, multicenter, single-arm, open-label interventional study designed with novel methodology and expert input to evaluate the impact of LXB on excessive daytime sleepiness, polysomnographic (PSG) sleep parameters, and functional outcomes in adults with idiopathic hypersomnia or narcolepsy (type 1 or 2).
Methods: DUET includes a screening period (with a 2-week washout for participants taking oxybate at study entry), 1-week baseline period (off-treatment), 2- to 8-week titration period (for flexible LXB dosing adjustments based on participants' needs), 2-week stable-dose period, 1- to 2-week end-of-treatment period (on LXB), and safety follow-up (after 2 weeks). To more comprehensively understand the impact of LXB on sleep architecture and other daytime/nighttime outcomes, novel design elements were integrated into the study. Input from an expert advisory board helped refine the study design and ensure that the most relevant elements for patients and clinicians were incorporated into the final DUET protocol. Responses from a premeeting survey of advisors focused on eligibility criteria, suitability of endpoints, newly created questionnaires, and analyses and were discussed during a 4-hour workshop with the study sponsor.
Results: Advisors were 6 clinicians with expertise in treating patients with idiopathic hypersomnia and narcolepsy and/or with expertise in PSG. Novel design aspects discussed and incorporated into the protocol included PSG conducted with ad libitum sleep duration, objective evaluation of sleep inertia using the Psychomotor Vigilance Test, a new questionnaire for capturing clinician-reported dosing to better understand dosing rationale, evaluation of motor activity during sleep (with PSG), and evaluation of dysautonomia using the Orthostatic Hypotension Questionnaire.
Conclusion: DUET is the first prospective evaluation of the impact of LXB on sleep architecture (PSG) in patients with idiopathic hypersomnia or narcolepsy. Results from these novel elements will provide patients and clinicians with additional information regarding the impact of LXB on nighttime/daytime symptomatology.
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0656

SEVERE AIR POLLUTION AS A POSSIBLE TRIGGERING FACTOR FOR KLEINE-LEVIN SYNDROME

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Introduction: Kleine-Levin Syndrome (KLS) is a rare neurological disorder characterized by recurrent episodes of hypersomnia, altered behavior, and cognitive disturbances. We report a case where severe air pollution seemingly acted as a trigger for a KLS episode in a patient with a history of viral-triggered and alcohol-associated episodes.
Methods: We present a case of a 17-year-old girl with a history of anxiety and migraine headaches, effectively managed with a stable dose of Lexapro 20 mg per day. The patient experienced multiple episodes of Kleine-Levin Syndrome (KLS) following viral infections and alcohol consumption. However, the fourth

episode was distinct, as it coincided with extreme air pollution in New York City. On the day that her symptoms started the Air Quality Index was reported to be above 480 technically off the chart. While there were no other known triggers for this fourth episode and the duration of the fourth episode was similar to the previous three ones.
Results: This case sheds light on potential environmental triggers for KLS and highlights the importance of understanding individual susceptibilities within this rare disorder.
Conclusion: This case emphasizes the need for a comprehensive approach to understanding KLS triggers, including environmental factors. The possibility of severe air pollution acting as a trigger adds a new dimension to our understanding of this enigmatic disorder. Further research is required to elucidate the relationship between air pollution and KLS, potentially offering insights into preventive strategies and tailored interventions for susceptible individuals.
Support (if any):

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0657

UNDERSTANDING THE DEBILITATING NATURE OF NARCOLEPSY IN PATIENTS' OWN WORDS: A SOCIAL LISTENING ANALYSIS

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Introduction: To further characterize the many struggles and unmet needs of people with narcolepsy (PWN), passive social listening was used to explore how PWN describe the condition using their own words.
Methods: MyNarcolepsyTeam is a social network where members can organically share their experiences living with narcolepsy with one another. Following an online survey, organic posts, comments, questions, and answers posted from January 2022 to present were analyzed.
Results: Of 110 survey respondents, 31% reported that the time from symptom onset to diagnosis was ≥10 years. Social listening highlighted both misdiagnoses (eg, depression) and "missed" diagnoses (eg, sleep apnea but not narcolepsy). Almost half (43%) of respondents reported pain as a comorbidity. Social listening revealed the burden of painful comorbidities (eg, fibromyalgia, migraines, neuropathy), which often lead to additional medications and further sleep disruption. While 90% of respondents reported excessive daytime sleepiness, 81% also reported sleep disturbances. Nighttime disruptions experienced by PWN included poor sleep quality, vivid dreams, frequent awakenings, sleep paralysis, and abnormal REM cycles. Structured routines helped improve sleep for some PWN. Additionally, 33% of respondents reporting cataplexy always experienced full body cataplexy; 21% always experienced localized cataplexy; 43% experienced a mix of both, with the remaining answering 'not sure.' Social listening highlighted the dangers of cataplexy, including falls/fractures. Organic conversations also brought to bear the full range of emotions that can trigger an attack – from laughter, to being startled, to feeling stressed. In total, 65% of respondents were taking ≥2 medications to treat daytime and/or nighttime narcolepsy symptoms. Organic conversations highlighted the challenges PWN experience managing complex treatment regimens in an attempt to cope with the full spectrum of narcolepsy symptoms.
Conclusion: Insight into how narcolepsy is experienced in patients' own words and how patients try to mitigate their symptoms will help sleep specialists better understand the challenges and needs of PWN, which can lead to both faster diagnosis and more effective, individualized treatment.
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0658

VALIDITY AND RELIABILITY OF THE PEDIATRIC NARCOLEPSY PATIENT-REPORTED OUTCOMES SCALE (PN-PROS)

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Introduction: There are currently no validated, patient-reported outcome measures for pediatric narcolepsy that assess disease burden, determine treatment efficacy, and guide future drug development. To ensure optimal clinical management of pediatric narcolepsy, we developed the Pediatric Narcolepsy Patient-Reported Outcomes Scale (PN-PROS) through literature review, content expert interviews, patient focus groups, and cognitive testing with patients (ages 9-17 years) and their parents. The aim of this study is to provide interim data from our multi-site validation and reliability study of the PN-PROS.
Methods: We performed field testing for validity and reliability of the PN-PROs in pediatric narcolepsy patients (9-17 years) with a comparator group of pediatric obstructive sleep apnea patients. We recruited participants from Boston Children's Hospital, Stanford Medical Center, Toronto Hospital for Sick Children (SickKids), and Geisinger Medical Center, as well as from narcolepsy patient advocacy meetings and websites. Participants completed the PN-PROS, Epworth Sleepiness Scale for Children and Adolescents (ESS-CHAD), Peds QL, and PROMIS Life Satisfaction using the REDCap data capture platform. Participants completed the PN-PROS item bank 1 week later for test-retest reliability.
Results: 83 pediatric patients with narcolepsy (mean age=15(2) years, 52.3% female, 26% non-Caucasian) and 60 pediatric patients with OSA (mean age=13.2(2.6), 46.3% female, 22% non-Caucasian) have completed all study measures. Discriminant Validity: Participants with narcolepsy reported a higher PN-PROS mean total score than participants with OSA [narcolepsy=126.9 (28.6), OSA=95 (31.2), $p< 0.001$]; results retain significance controlling for age, race and gender [group main effect: $F=36.6$, $p< 0.001$]. Content Validity: For participants with narcolepsy, the PN-PROS total score was significantly correlated with the ESS-CHAD ($r=0.64$, $p< 0.001$), Peds QL ($r=-0.84$, $p< 0.001$), and PROMIS Life Satisfaction ($r=-0.55$, $p< 0.001$). Reliability: Internal consistent was strong for both participants with narcolepsy (Cronbach alpha=0.94) and OSA (Cronbach alpha=0.93). Test-retest reliability was high for both participants with narcolepsy (interclass coefficient=0.94) and OSA (interclass coefficient=0.93).

Conclusion: Interim results suggest the PN-PROS is a valid and reliable measure for the evaluation of symptom frequency and burden for pediatric patients with narcolepsy. Data collection is ongoing, utilizing additional sites in other regions of the United States to ensure generalizability of our findings.
Support (if any): American Academy of Sleep Medicine

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0659
ESTABLISHMENT OF A HYPERSOMNIA BOARD: A MULTIDISCIPLINARY APPROACH TO COMPLEX HYPERSOMNIA CASES

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Introduction: Narcolepsy and other central disorders of hypersomnolence are conditions that often present challenging diagnostic and management dilemmas for clinicians. Inspired by the example of the Oncology Tumor Board system, we established a multidisciplinary board to aid in managing these complex sleep disorders with the specific goals of enhancing patient care while also offering additional educational opportunities for trainees. Here we present our initial experience with this Hypersomnia Board.
Methods: Beginning in early 2022, clinical practitioners from various disciplines relevant to the care of hypersomnia patients were recruited for board participation. Participants represent sleep medicine, psychiatry, neurology, clinical psychology, and pharmacy. Board meetings are held virtually once a month. Cases are selected for presentation from the participants' respective clinics and are presented by the treating physicians. Outcomes of the discussion including any recommended changes to the management plan are documented in the patient's medical record.
Results: To date, 14 hypersomnia cases have been presented to the board for discussion. Clinical dilemmas prompting board discussion have included refractory daytime sleepiness despite standard therapies, uncertainty related to a previous narcolepsy diagnosis, confounding mental health issues, or medication side effects. Etiology of hypersomnia was thought to be narcolepsy type 1 in 6/14 patients, NT2 in 4/14, idiopathic hypersomnia in 2/14, and obstructive sleep apnea (primary or co-morbid) in 6/14. Comorbid mental illness was common in the cases discussed (PTSD in 5/14, depression in 7/14, both in 2/14), as was concomitant OSA. Board discussion led to recommendations for medication changes in 4/14 and to other interventions (such as earlier referral to mental health specialists) or additional diagnostic testing in the remainder of patients. Clinicians involved including trainees have reported satisfaction with the opportunity to better collaborate on management of these complex cases and the added exposure to challenging hypersomnia cases.
Conclusion: The management of complex and relatively rare sleep disorders such as narcolepsy and other central disorders of hypersomnolence often requires multidisciplinary input, which our Hypersomnia Board has been able to facilitate. Further research is needed to assess the impact on patient-centered outcomes and on improving access to coordinated care for these disorders.
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0660
IN AND BETWEEN NAP MSLT FEATURES IN HYPERSOMNIA

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Introduction: This study aimed to identify novel markers of NT1 using between-nap and in-nap features of Multiple Sleep Latency Test (MSLT) recordings. We hypothesized that sleep-wake instability observed in NT1, alongside quantifiable patterns of sleepiness during wakefulness, may contain biomarkers for differentiating NT1 from other hypersomnia disorders between naps. Further, we wanted to explore if NT1 and NT2 MSLT could be distinguished beyond the common presence of a mean sleep latency below 8 minutes and multiple SOREMPs.
Methods: We analyzed in-between nap periods of MSLT recordings, extracting features describing sleepiness, microsleep patterns, and sleep-stage mixing, in three different sleep centers, based on the hypodensities obtained from U-sleep. 107 features were extracted from 178 patients diagnosed with NT1, NT2, Idiopathic Hypersomnia (IH), and Subjective IH (sIH), most with CSF hypocretin levels available. Second, we trained a model to distinguish NT1 from sIH and to differentiate NT1 from other hypersomnolence disorders, including IH plus NT2. A cross-cohort validation strategy was employed, involving training the model on combinations of two cohorts and validating on the third.
Results: Analysis indicated an increased probability of REM sleep during between-nap periods in the MSLT of NT1 patients, along with a greater prevalence of sleep stage mixing between REM and N1 sleep stages in microsleep episodes. In distinguishing NT1 from NT2, IH, and Subjective IH using features solely from between-nap periods of the MSLT, sensitivity was 0.72, specificity 0.70, and F1-score 0.62 across three validation cohorts. Distinguishing NT1 versus NT2 with between-nap features resulted in sensitivity 0.75, specificity 0.59 and F1-score 0.66 across three validation cohorts. When using features from the in-nap part of the MSLT, NT1 was distinguished from NT2 with sensitivity of 0.75, specificity of 0.82, and F1-score of 0.78 on average across the three validation cohorts.
Conclusion: The findings in this study support the hypothesis that NT1 patients exhibit increased sleepiness and sleep stage mixing during wake periods compared to other hypersomnolence disorders. Further, NT1 and NT2 could be partially distinguished using in-nap features, even so these two groups of subjects have positive MSLTs. This work supports the use of new analytical methods in MSLT.
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0661
SLOW WAVE ALTERATIONS DURING NOCTURNAL SLEEP IN HYPERSOMNOLENCE DISORDER

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Introduction: Hypersomnolence disorder (HD) is characterized by excessive daytime sleepiness of undetermined etiology. HD is poorly understood with no established biomarkers. Slow waves during non-rapid eye movement (NREM) sleep are associated with the restorative aspects of sleep. Since nonrestorative sleep is a core feature of HD, it is hypothesized that alterations in sleep slow waves may be an HD feature. Thus, this investigation was designed to evaluate slow wave activity (SWA) and characteristics (SWC) in HD, relative to healthy sleeper controls (HSC).
Methods: 60 unmedicated clinical patients meeting criteria for HD were compared against 29 HSC. All participants underwent polysomnography (PSG) and multiple sleep latency testing (MSLT) at Wisconsin Sleep, with other subjective and objective measures also collected. All-night, six-channel electroencephalography (EEG) data from ad libitum, nocturnal PSG were processed using a validated automatic protocol followed by manual inspection. For each channel of artifact-free EEG from NREM staged epochs, normalized SWA (1-4.5hz) and SWC (incidence, pre-slope, post-slope, and peak amplitude) were calculated in accordance with previously utilized methodology. Post-hoc analyses evaluated slow wave characteristic differences between low- and high-amplitude (≥40μV) slow waves. Linear regression compared groups across normalized SWA and SWC, with adjusted models accounting for relevant, available covariates.
Results: HD participants were young- to middle-aged (mean age = 28.6 ± 8.6) and predominantly female (percentage female = 78.3%), and HSC were comparable. HD participants displayed significantly reduced SWA across all channels, with effects most pronounced frontally and centrally, and greater in the left relative to right hemispheres. HD participants displayed significant alterations across all SWC, with generally consistent patterns of reductions in incidence, amplitude, and slope across frontal and central EEG derivations. SWC alterations varied significantly by both brain region and low- versus high-amplitude waves.
Conclusion: This study demonstrates and expands on a growing evidence base that alterations in slow waves may be a core feature of HD. Targeted studies that manipulate NREM slow waves in disorders of unexplained hypersomnolence, including modification of incidence and morphology varied by brain region and hemisphere, are required to clarify whether alterations in slow waves are causal to symptoms of hypersomnolence.
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0662

ACCURATE AUTOMATED SLEEP STAGING OF NARCOLEPTIC PATIENTS USING A MACHINE LEARNING MODEL

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Introduction: Accurate sleep staging of EEG data from polysomnography (PSG) is important in the diagnosis of narcolepsy. Human sleep staging is costly and labor intensive, but automated sleep staging algorithms must be rigorously tested in narcoleptic patients to ensure valid performance. PSGs of narcoleptic patients often tend to be more fragmented and variable than in non-narcoleptic populations, making it challenging for both humans and automated algorithms to accurately stage sleep. Here, we evaluate the performance of a deep learning model validated in a general sleep clinic population for staging nocturnal PSGs in patients with narcolepsy.
Methods: SleepStageML™, a deep-learning model for performing sleep staging on EEG signals, was trained on a large database of polysomnography recordings from a heterogenous population within the Beacon Clinico-PSG Database. The algorithm was evaluated on a held-out set of 28 overnight PSGs from patients with narcolepsy or hypersomnolence and 57 overnight PSGs from individuals without narcolepsy or hypersomnolence. Each PSG was manually scored by a human expert, and the performance of the automated algorithm was compared across the two cohorts.
Results: Automated sleep staging performance was high across both cohorts. The average F1-score for the control cohort and the narcolepsy cohort was 0.758 and 0.744 respectively. The positive percent agreements (PPAs) for the control cohort were 87%, 38%, 84%, 91%, and 93% for stages W, N1, N2, N3, and R respectively. For the narcolepsy cohort, the PPAs across the same stages were 91%, 33%, 81%, 86%, and 88% respectively. The algorithm's median absolute error in estimating REM latency, REM duration, and REM percentage in the control cohort was 1.25 minutes, 8.5 minutes, and 2% points, respectively. The same metrics for the narcolepsy cohort were 2.75 minutes, 11.75 minutes, and 3% points respectively.
Conclusion: A deep-learning model trained on diverse data automatically and accurately staged PSGs from narcoleptic patients and was comparable to performance of a human expert. The algorithm estimated REM parameters accurately in both cohorts. Automated staging algorithms like the one described here have the potential to accelerate diagnosis and monitor therapeutic efficacy for narcolepsy treatments by more efficiently and consistently staging sleep.
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0663

ASSESSING THE PREDICTIVE ACCURACY OF QUANTITATIVE ELECTROENCEPHALOGRAPHY IN THE DIAGNOSIS OF NARCOLEPSY

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Introduction: Narcolepsy is a chronic neurological disorder characterized by excessive daytime sleepiness (EDS), disturbed nocturnal sleep, and features of rapid eye movement (REM) sleep dissociation (i.e., cataplexy, hypnagogic hallucinations, sleep paralysis, and shortened REM-onset latency). the diagnosis is typically made by a multiple sleep latency test (MSLT), with reported sensitivity of 90% and specificity of 95%. However, MSLT can be difficult to schedule and can be influenced by other factors, such as anxiety, fear, and prescription medications (e.g., antidepressants). Building upon previous research demonstrating frequency- and region-specific electroencephalographic (EEG) imbalances in patients with narcolepsy, the present study aimed to assess the ability of quantitative electroencephalography (qEEG) to diagnose narcolepsy as compared to the reference standard MSLT.

Methods: Patients seen at an integrative health center in Houston, TX and identified with symptoms of narcolepsy, including chronic fatigue, underwent qEEG. If qEEG was concerning for narcolepsy, patients were referred to a sleep specialist and were included if they subsequently underwent an MSLT.
Results: Seventy-three patients (64 females, 9 males) were recruited with a mean age of 35±12.5 years. Of these, 35 patients had cataplexy. Sixty-nine (94.5%) of the 73 patients with positive qEEG had positive MSLT for narcolepsy: 31 (88.6%) in the cataplexy group and 38 (100%) in the non-cataplexy group. Of the remaining 4 patients, 2 had idiopathic hypersomnia on MSLT.
Conclusion: The findings suggest that qEEG holds promise as a valuable tool for diagnosing narcolepsy, potentially contributing to improved and timely clinical assessments. While potential variations in accuracy within specific symptoms should be considered, more research in the same population sample should evaluate the role of frequency- and region-specific EEG imbalances.
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0664

DEVELOPMENT OF A NOVEL PATIENT-REPORTED OUTCOME MEASURE OF FUNCTIONAL IMPACTS FOR NARCOLEPSY TYPES 1 AND 2

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Introduction: Narcolepsy, a rare, chronic neurologic disorder that affects sleep-wake stability, is associated with detrimental effects on functioning, quality of life, and productivity. There is a need for a fit-for-purpose clinical outcome assessment that captures the functional impacts of narcolepsy in various clinical settings to complement the Narcolepsy Severity Scale. The objective was to develop a new patient-reported outcome (PRO) measure, the Functional Impacts of Narcolepsy Instrument (FINI), for evaluating treatment response in patients with narcolepsy type 1 (NT1) or type 2 (NT2).
Methods: Initial item generation was derived using concept elicitation (patients with NT1, n=21), cognitive debriefing (NT1, n=20; NT2, n=15), and item debriefing with medical experts. A mixed-methods approach was used to determine the final PRO using two independent datasets: a cross-sectional, US observational NT1 study (n=126) and a global Phase 2 study (NT1 and NT2, n=125).
Results: Concept elicitation interviews were conducted with patients with NT1 to understand meaningful symptoms and impacts and generate items deemed relevant by patients and medical experts. The original instrument version was then refined and cognitively debriefed with patients in two stand-alone studies resulting in a 48-item pilot version. All items have a 7-day recall period on a 5-point Likert scale of frequency from "never" to "always" or severity from "not at all" to "very much." The four a priori factors were expanded to a six-factor structure based on exploratory factor analysis results and confirmed to be multidimensional on Rasch analysis, resulting in a final 28-item version with 6-domains (tiredness, cognitive functioning, cataplexy [for NT1], social activities, everyday activities, and everyday responsibilities) (FINI v1.0). Summary scores for each of 6 domains for NT1 and 5 domains for NT2 were calculated and transformed to a standardized scale from 0 (best health) to 100 (worst health).
Conclusion: The FINI is a modular, domain-specific assessment of functional impacts that is fit-for-purpose for patients with NT1 (FINI) and NT2 (FINI-NT2). It has demonstrated good content validity and psychometric methods support scoring and interpretation. The FINI can be used to generate evidence in clinical trials or practice for functional recovery in patients with NT1 and NT2.
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0665

DOES EXERCISE HAVE AN EFFECT ON DAYTIME SLEEPINESS?

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Introduction: Regular exercise improves sleep quality by reducing sleep onset latency, extending total sleep duration, and enhancing sleep efficiency, which may alleviate daytime sleepiness. However, the specific impact of exercise on daytime sleepiness remains unclear, with conflicting findings in the literature. We analyzed existing interventional studies which used Epworth Sleepiness Scale (ESS) to measure changes in degree of daytime sleepiness before and after an exercise regimen, allowing us to explore the relationship between exercise and daytime sleepiness.
Methods: Following PRISMA guidelines, a systematic search was conducted in electronic database of PubMed and Google Scholar from 1991 to the present. Thorough screening and inclusion criteria were applied to identify relevant studies which included ESS assessment before and after an exercise intervention. Also assessed sleep quality by Pittsburgh Sleep Quality Index (PSQI).
Results: Seven studies met all the inclusion criteria and were included in this study. Exercise exhibited a significantly beneficial impact on sleepiness measured by ESS in four out of seven studies we included in review while two studies showed a marginal reduction in ESS without statistical significance, and one study indicated no change. Additionally, exercise showed an improvement in sleep quality in four out of five studies that included PSQI. Variability in results was noted, influenced by factors such as exercise type, intensity, duration, and timing, as well as individual adherence. Additionally, exercise interventions improved sleep quality, as suggested by reduced scores in PSQI which may indirectly improve daytime sleepiness.
Conclusion: This analysis of existing interventional studies on exercise and daytime sleepiness suggests exercise can be beneficial for reducing daytime sleepiness and improving sleep quality. While the exact mechanism remains elusive, several factors contribute to the impact of both acute and chronic exercise on daytime sleepiness such as improved sleep quality, regulation of circadian rhythm, neurotransmitters release, stress reduction, increased energy levels, and weight reduction ultimately alleviating daytime sleepiness. Future research will be essential for addressing gaps on how exercise regimen and the underlying mechanisms may prove efficacious on improving daytime sleepiness.

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0666
IDIOPATHIC HYPERSOMNIA IN THE SLEEP APNEA POPULATION

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Introduction: Hypersomnia in OSA can have a significant impact on patient's quality of life. While hypersomnia tends to improve with treatment, there remains a portion of patients where this persists. This can often be attributed to inadequately controlled OSA, however the prevalence of idiopathic hypersomnia (IH) within the adequately treated OSA population remains unknown. With the emergence of new management strategies for IH, this becomes important to assess. We aim to evaluate the prevalence of patients with adequately treated OSA at risk for idiopathic hypersomnia using the idiopathic hypersomnia severity scale.
Methods: Surveys were administered to patients with OSA on CPAP demonstrating compliance of at least 80%. Surveys included IHSS, insomnia severity scale (ISI) and Epworth sleepiness scale (ESS). Patients were included if they used CPAP >6h/night, had an ISI< 14, no prior diagnosis of central hypersomnia and not on stimulant medication. IHSS >22 was considered high risk for IH based on prior validation studies.
Results: 54 patients met inclusion criteria; 7 (13%) were high risk for IH, 4 (57%) of which had ESS< 10. Age, sex, race, ethnicity and CPAP use were similar between high and low risk patients. Patients with IHSS>22 (high risk) had significantly higher BMI ($p< 0.05$).
Conclusion: Of patients who have adequately controlled OSA and are compliant with CPAP, our data suggests that 13% of them may be at high risk for idiopathic hypersomnia. Of these patients 57% of them would not have been identified using ESS alone. This may be related to the symptom specific questions included on the IHSS such as those related to sleep inertia, total sleep time etc. While further testing with PSG/MSLT is needed to confirm a diagnosis of IH, which is currently being offered to the high risk patients, this preliminary data suggests that increased screening for IH in this population may be beneficial.
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0667
NARCOLEPSY & IDIOPATHIC HYPERSOMNIA PATIENT JOURNEY, CLINICAL FEATURES AND TREATMENTS IN A REAL-WORLD US POPULATION

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Introduction: Narcolepsy and idiopathic hypersomnia (IH) are central disorders of hypersomnolence. People with narcolepsy type 1 (NT1), narcolepsy type 2 (NT2), and IH endure long diagnostic delays (up to 15 years), have many comorbidities, and suffer considerable, poorly recognized disease burden. Administrative health data present an opportunity to characterize these patients, their diagnosis, and treatment journey in real-world clinical practice.
Methods: This retrospective cohort study included patients aged ≥2 years with (non-diagnostic) medical claims for narcolepsy or IH between January 01, 2014 and December 31, 2021 in Optum's Market Clarity integrated claims and EHR database. Patients with ≥24 months continuous enrollment prior to last narcolepsy/IH diagnosis (index date) were classified into NT1; NT2; IH; NT2/IH cohorts. Patient journeys, including diagnostic evaluations and treatments, were described using all enrolled time, while comorbidities were described during a 12-month baseline period.
Results: Overall, 51,548 patients (median age: 45 years [IQR 32–58]; female: 64%) were included with a median pre-index observation period of 52 months: 7,742 (15%) NT1; 31,132 (60%) NT2; 12,287 (24%) IH; and 387 (1%) NT2/IH. Cardiovascular disease (52%), depression (39%), anxiety disorders (38%), obesity (32%) and sleep apnea (40%) were similarly common across cohorts during the 12 months pre-index. Substance-abuse disorders were reported among 18%–19% of narcolepsy and 13%–14% of IH cohorts. Most patients (81%) had a consistent diagnosis (NT1;NT2;IH) throughout the study period, but 9,608 patients had diagnosis switches, most commonly NT2->NT1 (n=3,355), NT1->NT2 (n=2,656), NT2->IH (n=1,187), IH->NT2 (n=859) or NT1->IH (n=205). Among patients with these most common switches (n=8,262), 68% had no record of sleep tests between the switches and 38% had no sleep test recorded during all observed time. Common treatments included SSRI/SNRI (57%), stimulants (41%), and wake-promoting agents (39%); 15% of NT1 patients received oxybate and 2.6% pitolisant. Among patients without a diagnosis switch (n=41,940), 26% did not receive any NT/IH medication after diagnosis.
Conclusion: In a large real-world US population, sleep diagnostic evaluations were underutilized and many patients were untreated. A small proportion received narcolepsy-specific medications. These results indicate an unmet need for effective diagnostic and treatment strategies for patients with narcolepsy/IH.
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NARCOLEPSY DISORDERS EXPLAINABILITY IN EEG VIA SPECTRAL BAND CLUSTER PREVALENCE

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Introduction: AI models have previously demonstrated clinically promising performance for detecting Narcolepsy Type-1 (NT1) versus clinical control patients in overnight polysomnography (PSG), while explainability of AI detection for complex disorders remains an unsolved challenge. Seeking to increase explanatory power of AI results, we introduce a novel analysis method, Spectral-Band Cluster-Prevalence (SBCP), for clustering and categorizing PSG without AI/ML techniques or sleep

scoring measures. We demonstrate the method for explainability of EEG comparisons evaluating Narcolepsy versus clinical control groups.
Methods: Our data source was retrospective EEG/EOG recordings from N=78 PSG participants including n=54 Narcolepsy Type-1 diagnosed patients (based on MSLT findings and patient-reported Cataplexy) with n=24 clinical controls. EEG channels were excluded based on artifact, normalized to maximum voltage, EOGs normalized to in-channel voltage, then extracted into 10-second segments. Signal features were extracted for each segment: EEG delta (1-4), theta (4-8), alpha (8-12), beta (12-30) spectral band-powers and EOG broadband-powers. Feature EEG band-powers were projected into 3-dimensional subspace, where optimal parameters for Gaussian Mixture Model (GMM) were identified to allow overlapping EEG states. Cluster quality measures Silhouette, Davies-Bouldin, Akaike-Information-Criterion were evaluated to determine the optimal number of components (i.e. unique EEG states) required by the GMM to maximize explainability based on global optima in cluster quality values. Dwell Fraction was estimated by assigning components to each 10-second EEG segment, and reported for comparison between NT1 and clinical controls.
Results: The global optima GMM identified n=3 unique components as the optimal number of components for describing 10-second segments of EEG/EOG in terms of explainability and predictability of between-group differences for NT1-vs-controls. The n=3 components GMM showed the highest cluster quality scores in Silhouette (0.23), DB (2.30), and AIC (-7,318,399). Components were characterized by differences in spectral and broadband-power distributions. Dwell Fraction, the percent of sleep-time in each component, revealed statistically significant differences associated with Narcolepsy (Component-1: NT1< Normals, Component-2: NT1> Normals) in Mann-Whitney-U and t-test results. ROC-AUCs were calculated for classifying NT1-vs-Normals, based only on percentage of time spent in each component (Component-1: 0.71, Component-2: 0.78).
Conclusion: We demonstrate novel analytic methods for explainability, SBCP, with potential applications to Narcolepsy disorder-specific EEG biomarkers and AI understandability.
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0669

OXIDATIVE STRESS IN HYPERSOMNIA PATIENTS: CORRELATION WITH SLEEP ONSET REM PERIOD

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Introduction: Glutathione is the most abundant cell antioxidants. The ratio of reduced and oxidized glutathione (GSH, GSSG) has been used as a marker for oxidative stress and reduced glutathione levels contributes to the onset and progression of many diseases. In sleep research field, oxidative stress has been studied mostly in sleep apnea syndrome and sleep deprivation but not in hypersomnia. Since GSSG is one of the sleep promoting substances, we hypothesized that oxidative stress contributed to the pathophysiology of hypersomnia and examined the relationship between glutathione and sleep variables in sleepy subjects.
Methods: Participants were patients visiting outpatient clinic for sleep disorders in Koishikawa Tokyo Hospital, Institute of Neuropsychiatry and underwent diagnostic PSG-MSLT from June 2020 to Nov 2023. Written informed consents were obtained. We selected 280 patients (25.6±9.3 years old, f/m=148/132) without medication at sleep study and slept more than 5.5 hours during nocturnal PSG. Fasting blood samples were collected at 7am before MSLT and RBC fraction were stored at -80 degree until use. RBC were deproteinized with perchloric acid and supernatant after centrifugation was measured by HPLC-ECD with boron-doped diamond electrode. GSH proportion of the total glutathione [GSH/(GSH+GSSG)] were calculated and correlation with sleep variables and ESS score were investigated. To adjust possible confounders, regression analyses were performed using Logit transformed GSH proportion as objective variable.
Results: We found that GSH proportion showed negative correlation with age (P<.001) and sex differences (lower in female). We also found that GSH proportion showed positive correlation with presence/absence of SOREMP on MSLT(P=.007) and negative correlation with ESS score (P=.046). Correlation with SOREMP remained significant after adjusting the HLA -DQB1*06:02 status.
Conclusion: Our data showed that those with higher oxidative stress have higher ESS score and those without SOREMP on MSLT showed higher oxidative stress. Subgroup analysis showed that those without SOREMP and HLA-DQB1*06:02 have higher oxidative stress compared to others. SOREMP on MSLT is a diagnostic marker for Narcolepsy type 1 but SOREMP can be observed in general population. Our data could provide biochemical basis for the occurrence SOREMP.
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0670

PATTERNS OF NOCTURNAL SLEEP DISRUPTION: DIFFERENTIATING IH FROM NT2 USING CLUSTER ANALYSIS

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Introduction: Disambiguation of type 2 narcolepsy (NT2) from idiopathic hypersomnia (IH) is notably challenging, given the absence of biomarkers and testing (MSLT) limitations. The utility of nocturnal sleep features for diagnostic differentiation of NT2 vs. IH has yielded some promising findings. However, data are limited by the reliance on the MSLT to define CNS subtypes, yielding critical weaknesses in generalizability and inference. The goals of this study were to (1) quantify and qualify patterns of sleep disruption in patients being evaluated for hypersomnia, agnostic of MSLT outcomes [blinded] and (2) evaluate congruence between nocturnal endotypes and unblinded MSLT outcomes/diagnoses.
Methods: This study used BioSerenity's archival database of patients being evaluated for hypersomnia with in-lab PSG-MSLT. A total of N=697 PSGs met inclusion criteria. Records were scored by senior RPSGTs and spectral power was computed on raw tracings using FFT with Welch's method. Data for each 30-s epoch were exported for tabulation summary variables, state sequences, and transition indices. Data were ingested into a statistical program for unsupervised cluster analysis.

Results: A two-step unsupervised cluster analysis was performed on 18 PSG features; 5 were retained for cohesion: # wake-REM sequences, sleep-wake and REM transition indices, WASO, and arousal index (p<.001). The model identified 3 clusters of patients with homogeneous patterns of sleep disruption. Cluster 1 (n=88) had notably disrupted sleep and REM, cluster 2 (n=210) had sleep (not REM) disruption with WASO, and cluster 3 (n=399) had well-consolidated sleep. A multinomial logistic regression indicated similar MSLT outcomes for clusters 1 and 3 (p=.385), whereas cluster 2 had the fewest >2 MSLT REMs (17% vs. 27%; p<.001) and longest MSL (8.7 min vs. 7.1 min; p<.001).
Conclusion: This data-driven approach produced 3 distinct groups of nocturnal features that, in theory, were compatible with the conceptual distinction of NT2 from IH. However, MSLT outcomes of NT2 and IH did not reflect a differential pattern of cluster membership. While further data are needed to evaluate the clinical utility of nocturnal sleep/REM features in predicting outcomes, PSG features of sleep/REM disruption, when adjudicated against MSLT outcomes, may provide nuance to guide interpretation and additional testing.
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0671
RACIAL AND ETHNIC CHARACTERISTICS IN ADULTS LIVING WITH NARCOLEPSY

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Introduction: Demographics and polysomnographic characteristics (PC) stratified by race and ethnicity in narcolepsy type 1 and 2 (NC1-2) have been occasionally examined. Despite differences in definitions, most studies in NC1-2 have used race and ethnicity terms interchangeably. This study in adults living with narcolepsy (ALWNC) examined demographics and PC by race and ethnicity separately.
Methods: This cross-sectional study at a large academic center identified ALWNC through detailed chart review. Adults aged ≥18 years with NC1-2 diagnosis were included. We stratified participants based on self-reported race (Asian, Black, White, Others) and ethnicity (Hispanic, non-Hispanic, and Others). Descriptive statistics were obtained per racial and ethnic groups. Linear regression models adjusted for age and body mass index (BMI) at diagnosis, gender, NC1-2, and race or ethnicity (accordingly) were utilized to examine associations between race, ethnicity, and mean sleep latency (MSL) and number of sleep onset REM periods (SOREMPs).
Results: We identified 250 participants; 58% had NC2, 70.8 % were females, mean age and BMI at diagnosis were 29.1±12.9 years and 26.0±6.3 Kg/m2, respectively. Asian, Black, White, and Other races were 8, 28, 194, and 20 participants, respectively. Hispanic, non-Hispanic, and Other ethnicities were 14, 225, and 11 participants, respectively. Blacks had significantly shorter MSL and greater number of SOREMPs than Asians, Whites, and Other races (2.7±2.1 vs. 3.8±1.1, 4.8±2.4, 4.7±2.4 minutes, and 3.3±1.3 vs. 2.4±0.9, 2.5±1.3, 2.0±1.3 SOREMPs, respectively). Other ethnicities had shorter MSL and greater number of SOREMPs than Hispanics and non-Hispanics (3.3±2.9 vs. 4.6±2.4, 4.5±2.4 minutes, and 3.1±1.2 vs. 2.2±1.5, 2.5±1.3 SOREMPs, respectively); albeit, statistically insignificant. Adjusted analyses showed associations between Black race and MSL (β=-1.7, 95% CI [-2.9, -0.6] minutes), and between Black, Other races, and number of SOREMPs (β=0.7, 95% CI [0.1,1.3]; β=-0.9, 95% CI [-1.8, -0.1] SOREMPs, respectively). No associations were observed between ethnicity and MSL or number of SOREMPs.
Conclusion: This study highlighted racial differences in PC among ALWNC. Blacks had shorter MSL and greater number of SOREMPs, while Other races had lesser number of SOREMPs. In addition, this report suggested a trend toward ethnic differences in NC PC.
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0672
SLEEPINESS, PSYCHOMOTOR VIGILANCE AND COGNITION IN PEOPLE WITH OSA ADHERENT TO PAP THERAPY

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Introduction: Residual excessive daytime sleepiness (EDS) is common in people with obstructive sleep apnea (OSA) using positive airway pressure (PAP) regularly, and has been associated with reduced functional outcomes.We examined the association of EDS using the psychomotor vigilance test (PVT) and cognition in patients with OSA adherent to PAP. We hypothesized that objective sleepiness is associated with worse cognitive function.
Methods: This cross-sectional study included participants aged ≥40 years, from an academic sleep disorder center using PAP therapy for ≥6 months with a minimum use of 6 hours per night. Exclusions were diagnosis of dementia, cognitive impairment, stroke, and sleep disordersincluding narcolepsy, parasomnias and PMLD. Demographics, medical history, behavioral data including the Epworth Sleepiness Scale (ESS), were gathered through questionnaires and medical records.Cognitive data was collected using NeuroTrax™, assessing attention, executive function, memory, processing speed, and global cognition. Linear regression analyses were performed between cognitive domains and PVT outcomes (lapses ≥500ms and average reaction time (RT)).
Results: The cohort included 31 participants (71% Hispanic-Latino, 29% women) with mean age 61 (SD=8.95), and mean AHI 33.13 (SD=22.05). PVT data indicated an average RT of 404.30 ms and an average number of lapses (≥ 500 ms) at 8.20. Cognitive assessments revealed scores for global cognition (m= 103.25, SD=10.83), verbal memory (m= 97.76, SD= 12.50), executive function (m= 106.42, SD= 11.82), attention (m= 101.72, SD= 10.54), and information processing speed (m= 101.66, SD=21.05). Pearson's test showed a correlation between lapses (≥ 500 ms) and memory (r = -0.44; p = 0.008), and average RT with age (r = 0.46; p = 0.006). No correlation was found between lapses (≥ 500 ms) and ESS (r = 0.21; p = 0.26) or average RT and ESS (r = 0.045; p = 0.81). Linear regression analysis, adjusting for age, showed an association between lapses with worse memory function (β= -0.86, p = 0.017), as well as average RT

with worse information processing speed (β = -0.089, p = 0.049). Other cognitive domains were not associated with the PVT.
Conclusion: In people with OSA optimally adherent to PAP, objective sleepiness was associated with worse memory function and information processing speed.
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0673

THE BURDEN OF LIVING WITH NARCOLEPSY : PATIENT PERSPECTIVES FROM IN-DEPTH QUALITATIVE INTERVIEWS

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Introduction: Narcolepsy is a chronic neurological disorder characterized by excessive daytime sleepiness, among other symptoms. This rare condition may be associated with negative impacts to patients' lives, including impaired mental and physical health, increased stigma, and difficulty obtaining an education or maintaining employment. Previous studies that have identified the burden associated with narcolepsy have largely relied on quantitative methods (e.g., surveys), providing limited insights into the patient experience. This study used qualitative, in-depth interviews to characterize the burden of narcolepsy.
Methods: Participant recruitment included convenience and snowball sampling. Sixty-minute individual interviews were conducted online by trained qualitative researchers. Interviewers used a concept elicitation approach with a semi-structured interview guide to elicit descriptions of patients' experiences. Interview transcripts were coded and thematically analyzed using inductive and deductive approaches.
Results: Twenty-two adults with narcolepsy (type 1 [NT1] =12; type 2 [NT2=10]) participated in this study (average age: NT1=35; NT2=44). Most identified as female (NT1=83%; NT2=70%) and white (NT1=75%; NT2=60%). Approximately half of participants were employed (NT1=58%; NT2=50%). Average time since diagnosis was 7 years for NT1 and 11 years for NT2. Participants described several ways that narcolepsy has negatively impacted their lives. All or nearly all participants cited impacts on: work and school activities (e.g., trouble concentrating on tasks, forgetting information, falling asleep during meetings or conversations; NT1=100%; NT2=100%), mental health (e.g., depression, frustration, anxiety, embarrassment, lack of motivation; NT1=100%; NT2=90%), and instrumental activities of daily living (e.g., home maintenance, cooking/preparing meals, driving; NT1=92%; NT2=100%). Most participants also described negative impacts on their relationships with family, friends, and romantic partners (e.g., reduced time spent with children, strain on marriage; NT1=83%; NT2=80%) and activities of daily living (e.g., eating, bathing, dressing/grooming, toileting; NT1=92%; NT2=60%).
Conclusion: Results from this study demonstrate the wide breadth of impacts narcolepsy has on patients' lives and, in so doing, helps to fill a gap in the literature by providing rich insights into the patient experience of narcolepsy.
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0674

THE FUNCTIONAL IMPACTS OF NARCOLEPSY INSTRUMENT DIFFERENTIATES PATIENTS WITH NARCOLEPSY FROM HEALTHY CONTROLS

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Introduction: The Functional Impacts of Narcolepsy Instrument (FINI) is a fit-for-purpose patient-reported outcome (PRO) measure developed for the assessment of patients with narcolepsy type 1 (NT1) or type 2 (NT2). To provide a baseline for interpretation in future interventional trials, comparative scores for the FINI domains were obtained from a cohort of healthy volunteers included in a United States observational study.
Methods: Healthy volunteers without excessive daytime sleepiness (EDS; ≤10 on the Epworth Sleepiness Scale [ESS] at screening) or any associated medical disorder were eligible for inclusion. Participants received a link to complete a cross-sectional online survey that included a 23-item, 5-domain form of the FINI (excluding cataplexy items) and additional selected quality of life reference questionnaires (SF-36 and EQ-5D). FINI items evaluate narcolepsy/EDS symptoms and impacts on daily functioning. All items have a 7-day recall period on a 5-point Likert scale of frequency from "never" to "always" or severity from "not at all" to "very much." For each domain, an average item score is calculated and standardized to a 0–100 scale. Lower scores indicate better health/functioning. Responses were compared to patients with NT1 and NT2 from an observational study (n=126) and a phase 2 trial (NCT04096560; n=125).
Results: Thirty-one healthy volunteers (45.2% female) completed the survey. Participants had a mean age of 44.8 years and a median (range) ESS score of 4.0 (0–10.0) at baseline. FINI domain scores ranged from 10.0 to 22.2 in healthy volunteers, significantly lower than values reported for patients with narcolepsy in observational and phase 2 studies (46.2 to 67.9). Similar patterns were observed for reference PROs, with better quality of life/health status reported for healthy controls than for narcolepsy samples. Mean (SD) FINI domain values for healthy volunteers were: Tiredness: 22.2 (19.8); Cognitive Functioning: 10.0 (10.5); Social Activities: 16.1 (17.1); Everyday Activities: 12.9 (10.7); and Everyday Responsibilities: 11.6 (15.8).
Conclusion: Mean FINI domain scores from healthy volunteers can serve as normative thresholds and provide a benchmark for comparison of FINI responses reported by patients with narcolepsy, allowing for the evaluation of treatment effects in clinical trials.
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0675

EFFECTS OF CIRCADIAN ACCLIMATION OF PERFORMANCE, SLEEP, 6-SULFATOXYMELATONIN ON HEART RATE & HEART RATE VARIABILITY

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Introduction: Jet lag is associated with transmeridian travel across at least two time zones, associated with sleep disturbance as well as daytime dysfunction. The presence of jet lag has been hypothesized to be associated with adverse cardiovascular outcomes; however, objective data are not available. Jet lag can have many negative effects on physical and mental health, mental and physiological performance, and sleep. The objective of this study is to understand the impact of simulated jet lag on heart rate.
Methods: Following a baseline circadian rhythm assessment, participants were placed on a 16 hour wake – 8 hour sleep schedule in which the wake-sleep and light-dark schedule was delayed by 8 hours for 3 days (analogous to traveling 8 time zones west). Participants were randomized to one of 3 treatments administered each of the 3 days of the shifted schedule: (A) placebo control, (B) bright light, and (C) bright light + exercise + melatonin. Participants wore an Extended Wear Holter Monitor for the duration of the 6.5 day laboratory stay. Minimum, average and maximum heart rates as well as heart rate variability were evaluated for each phase in the laboratory.
Results: 15 of the 22 patients enrolled wore the Holter monitor and completed the study (86.6% men, mean age 28.4 ± 9.56)— 5 were in the placebo arm, 7 in bright light, 3 in the bright light + exercise + melatonin group. In the placebo group, the average heart rate in beats per minute (± SD) increased in the first ultrashort period when compared to baseline (70 (6) vs. 66 (8), p =0.022). In the bright light group, the average heart rate (± SD) decreased during the shifted schedule when compared to baseline (70 (14) vs. 74 (4), p =0.015). No other significant changes were noted.
Conclusion: The initial induction of jet lag seems to have detrimental effects on heart rate, however the body adjusts thereafter and bright light may be helpful to reduce the impact of jet lag on heart rate.
Support (if any): Department of Defense, Philips, American Academy of Sleep Medicine Foundation, National Institutes of Health, The University of Arizona.

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0676

THE EFFECTS OF CIRCADIAN ACCLIMATION OF PERFORMANCE, SLEEP, AND 6-SULFATOXYMELATONIN ON QTC AND QT VARIABILITY

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Introduction: Jet lag is a circadian rhythm disorder whose effects on QTc and QT variability are unknown. QTc and QT variability are markers of ventricular repolarization associated with ventricular arrhythmias including torsade de pointes and overall mortality. The objective of this study is to understand the impact of simulated jet lag on QTc and QT variability.
Methods: Following a baseline circadian rhythm assessment, participants were placed on a 16 hour wake - 8 hour sleep schedule in which the wake-sleep and light-dark schedule was delayed by 8 hours for 3 days (analogous to traveling 8 time zones west). Participants were randomized to one of 3 treatments administered each of the 3 days of the shifted schedule: (A) placebo control, (B) bright light, and (C) bright light + exercise + melatonin. Participants wore an Extended Wear Holter Monitor for the duration of the 6.5 day laboratory stay. Bazette's correction was used to correct the QT interval for heart rate. The standard deviation of QTc was used as a marker of QT variability.
Results: 15 of the 22 patients completed the study with the Holter monitor in place (86.6% men, mean age 28.4 ± 9.56). In the bright light group, the average QTc in milliseconds (± SD) declined in the in the first ultrashort sleep/wake schedule (406 (19), p=0.04), the shifted light dark and sleep wake schedule (404(23), p=0.053) and second ultrashort period (396 (26), p=0.015) when compared with baseline (410(24)). In the bright light + exercise + melatonin group the average QTc (± SD) increased during the shifted schedule when compared to baseline (403 (40) vs. 410 (40), p =0.02). No other significant changes were noted.
Conclusion: There may be effects of jet lag and its treatment on QTc length though larger studies are needed to further explore this relationship.
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0677

WINDING DOWN FOR THE NIGHT: CHANGES IN THALAMOCORTICAL CONNECTIVITY BEFORE BED ARE ASSOCIATED WITH DEEPER SLEEP

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Introduction: According to the arousal hypothesis, insomnia is often the result of excessive cognitive and somatic arousal during the sleep period. Individuals with insomnia show greater cortico-thalamic functional connectivity during waking hours than healthy sleepers. However, prior studies have only examined such connectivity at a static time point without considering dynamic changes in cortico-thalamic connectivity in the hours prior to sleep. Here, we examined the association between changes in cortico-thalamic connectivity across the 4-hours prior to sleep and subsequent overnight sleep parameters measured by polysomnography (PSG) among individuals with insomnia.
Methods: Twenty participants (12 female; age=26.9, SD=6.6 years) with insomnia symptoms completed two serial resting-state functional connectivity (rsFC) MRI sessions in the early evening (1900-2000 and 2100-2200 hrs.) followed by PSG monitored sleep from 2300 to 0700 in a controlled sleep laboratory. Sleep parameters, including time in wake, N1, N2, N3, total sleep time (TST), sleep efficiency (SE), and rapid eye movement (REM) sleep were entered into a series of seed-to-voxel

whole-brain analyses using the CONN Toolbox (v21.a). The seed region comprised bilateral thalami as defined by the Automated Anatomical Labeling Atlas. The correlation between the change in cortico-thalamic connectivity and subsequent time in each sleep stage was calculated. Data were analyzed with peak threshold of p<.005 (uncorrected) and p<.05 False-Discovery-Rate (FDR) cluster correction.
Results: Greater declines in cortico-thalamic connectivity prior to bedtime were associated with significantly more N3 sleep (i.e., anticorrelated connectivity to left orbitofrontal cortex, middle frontal gyrus, putamen, insula, and medial prefrontal/paracingulate gyrus), and more REM sleep (i.e., anticorrelated connectivity to the left lateral occipital cortex). Interestingly, greater cortico-thalamic connectivity to the bilateral visual cortex and frontal pole during this same pre-sleep period was associated with more time in stage N2 sleep. Changes in connectivity were not associated with wake, N1, TST, or SE.
Conclusion: Among individuals with insomnia, greater declines in cortico-thalamic connectivity, particularly regions associated with emotion, interoception, and sensory-motor processes, predicted more time in slow-wave sleep, also known as the 'deep sleep' stage. Findings support the arousal hypothesis and suggest that interventions that facilitate cortico-thalamic gating may prove useful in facilitating sleep and treating insomnia.
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0678

GENETIC VARIANTS ASSOCIATED WITH DIM LIGHT MELATONIN ONSET IN A DELAYED SLEEP-WAKE PHASE DISORDER COHORT

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Introduction: We are conducting a double-blind, randomized, clinical study in Delayed Sleep-Wake Phase Disorder (DSWPD) participants with extensive clinical phenotyping. We evaluated screening Dim Light Melatonin Onset (DLMO) assessments in participants with a DSWPD diagnosis to determine the proportion of participants with and without a circadian delay.
Methods: Delayed DLMO is DLMO occurring after or within 60 minutes before desired bedtime, and after 22:00. Each DLMO assessment consisted of eight saliva collections performed at five, four, three, two, and one hour before bedtime, at planned bedtime, and one and three hours after bedtime. DLMO assessments were distributed to participants at Visit 1 (screening) and Visit 3 (treatment) with a questionnaire to record planned and actual collection times. Participants were instructed to wear blue-light blocking glasses. The Morningness-Eveningness Questionnaire (MEQ) was also completed by participants at V1 to evaluate circadian and sleep rhythm patterns. DLMO was defined as the clock time when the melatonin concentration exceeded the mean of three low consecutive values, plus twice the standard deviation of these points. Additionally, a sample for whole genome sequencing was collected.
Results: Forty-seven participants with DSWPD completed the screening DLMO assessment, 38 of which had a DLMO after 22:00 (80.9%). Sub-analyses were conducted on these participants who had delayed DLMO. Within this subset, the average DLMO time was 23:41 and the average MEQ score was significantly lower than those without a circadian delay. Of these 38 participants, 19 had a DLMO time after 00:00. Furthermore, we completed a linear regression analysis on DLMO time in a circadian gene set. The top scoring variant was 3' UTR rs10181401 in PER2, amongst others detected.
Conclusion: These initial data indicate that, on average, participants with DSWPD that completed the screening DLMO assessment had delayed DLMO. Further analyses show that half of this subset had significantly delayed DLMO (00:00 or later). This study is currently ongoing and blinded. Further data will be analyzed as more participants enroll. 'Phase typing' will be important in further understanding the underlying pathophysiology and in the treatment selection for patients with DSWPD.
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0679

SLEEP REACTIVITY IN SHIFT WORKERS: IN ASSOCIATION WITH SLEEP DISTURBANCE, MOOD SYMPTOMS, AND QUALITY OF LIFE

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Introduction: Shift work is associated with sleep disturbance, mood problems, and quality of life. Sleep reactivity, a trait-like characteristic reflecting how stress disrupts sleep, is related to insomnia, depression, and shift-work disorder. We aim to investigate the relationship between sleep reactivity and shift work, exploring the associations between sleep reactivity and sleep disturbance, mood symptoms, or quality of life in shift workers.
Methods: Seventy shift workers (SW, 55 females, 30.47±5.90 years old) and 54 healthy controls (HC, 36 females, 31.76±6.59 years old) participated in the current study. All participants completed self-reported measurements, including the Ford Insomnia Response to Stress Test (FIRST), Insomnia Severity Index (ISI), Pittsburgh Sleep Quality Index (PSQI), Epworth Sleepiness Scale (ESS), Beck Depression Inventory (BDI), Beck Anxiety Inventory (BAI), Morningness-Eveningness Questionnaire (MEQ), and the World Health Organization Quality of Life (WHOQOL). We compared scores on self-reported measurements between SW and HC. Subsequently, we examined the interaction effect between FIRST and shift work. Within SW, we used multiple linear regression to investigate the relationship between FIRST and scores on self-reported questionnaires, adjusting for age, sex, shift work duration, and chronotype. We used SPSS 22 for statistical analysis.
Results: SW showed higher scores on BDI (t=2.97, p=0.004) and ISI (t=3.04, p=0.003) than HC. In SW, the high sleep reactivity (FIRST≥18) subgroup showed higher scores on ESS, PSQI, ISI, BDI, BAI, and lower WHOQOL compared to the low sleep reactivity (FIRST< 18) subgroup. We found a similar pattern, but only PSQI, BDI, and BAI showed significant differences in HC. Two-way ANOVA revealed an interaction effect between FIRST and shift work on WHOQOL (F=5.636, p=0.020). Multiple regression analysis found that high sleep reactivity was associated with high ISI (p=0.002), BDI (p=0.004), BAI (p=0.020), and low WHOQOL (p< 0.001) in SW.

Conclusion: Our findings suggest that sleep reactivity could be key in shift workers' quality of life. In addition, current results indicate that high sleep reactivity in shift workers can be associated with increased sleep disturbance, depressed mood, and decreased quality of life. This suggests that sleep reactivity may serve as a predictive factor for shift work tolerance.
Support (if any): National Research Foundation (No. 2016M3C7A1904338 and No. NRF-2022R1A2C1008209)

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0680

BODY CLOCK AND AGING: RELATIONSHIPS OF CIRCADIAN RHYTHM WITH SLEEP QUALITY, MENTAL HEALTH AND GERIATRIC CONDITIONS

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Introduction: Circadian rhythm is associated with sleep quality and mental health. Research to date has been primarily focussed on adolescent and general adult populations, with little inquiry in older adults, whom have relatively earlier circadian phases. We sought to clarify correlates of circadian function with sleep quality and mental health, in addition to geriatric conditions to further explore these relationships in an older adult population.
Methods: We undertook a cross-sectional study of 67 community-dwelling older adults (≥60yrs) with self-reported sleep complaints. Circadian rhythm was assessed with 7-day actigraphy, to derive sleep midpoint and variables of circadian strength (interdaily stability (IS), intradaily variability (IV), amplitude, and MESOR), calculated using non-parametric or cosinor analysis. Assessments evaluated outcome measures of subjective sleep quality (Insomnia Severity Index [ISI], Pittsburgh Sleep Quality Index [PSQI], Epworth Sleepiness Scale [ESS]), objective sleep physiology (nocturnal polysomnography parameters), mental health (prior psychiatric diagnosis [depression, bipolar anxiety, PTSD], Patient Health Questionnaire of depressive symptoms [PHQ8], Generalized Anxiety Disorder Questionnaire [GAD2]), geriatric conditions (age, frailty [Fried phenotype], cognition with Montreal Cognitive Assessment [MOCA], falls (≥1 in past year), multimorbidity [≥3 chronic conditions], and polypharmacy [≥5 medications]). Pearson correlation coefficients were employed to investigate relationships.
Results: Circadian rhythm markers (lower amplitude, MESOR) were associated with daytime sleepiness (r=0.25-0.29, p values < 0.05). Later sleep midpoint was correlated with reduced total sleep time on PSG (r=0.36, p< 0.05), and lower ISI severity (r=0.29, p< 0.05). Measures of circadian weakness (lower IS, higher IV) were associated with mental health diagnoses (r=0.25-0.30; p values < 0.05), though no significant associations were seen with psychiatric symptoms. Earlier sleep midpoint was correlated with increasing age (r=0.41, p< 0.05). Parameters of circadian weakness (low IS, high IV, low amplitude) were associated with lower cognitive scores (r=0.32-0.44, p values < 0.05) and multimorbidity (r=0.30-0.36, p values < 0.05).
Conclusion: Our data strengthens links between circadian rhythm characteristics with sleep quality and mental health conditions, demonstrating generalizability to older adult populations. Markers of weaker circadian rhythm were associated with cognitive dysfunction and multimorbidity. Future research should examine the association of circadian markers with incident geriatric illness longitudinally.
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0681

CIRCADIAN REST/ACTIVITY RHYTHMS ARE ASSOCIATED WITH COGNITIVE FLEXIBILITY AMONG OLDER ADULTS WITH INSOMNIA

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Introduction: Circadian rest/activity rhythms (RARs) are associated with cognitive function among older adults. Reports of poor cognitive function are common among individuals with insomnia. We examined the association of circadian RARs with performance in multiple cognitive domains among older adults with insomnia.
Methods: Older adults with insomnia were recruited from a tertiary academic medical center. Participants wore an actigraph and completed concurrent sleep diaries for up to 14 days. We derived nonparametric circadian RARs including relative amplitude (RA), interdaily stability (IS), intradaily variability (IV), maximum ten-hour activity (M10) and minimum five-hour activity (L5). Secondary parametric RARs included amplitude, acrophase, and midline statistics of rhythm (MESOR). Cognitive function was measured via the Brief Test of Adult Cognition by Telephone as well as in-home computerized administration of the psychomotor vigilance test, Stroop Test, and a Task-switching test. Cognitive testing results were grouped into eight a priori-defined domains (attention, inhibition, cognitive flexibility, episodic verbal memory, working memory, reasoning, executive function, processing speed). Composite domain scores were calculated by averaging the z-scores for all individual tests within that domain. Finally, a series of 64 linear regression models were tested to determine the association between circadian RAR parameters and cognitive domains. All models were adjusted for age, sex, education, and total sleep time. We used the Benjamini-Hochberg procedure for correcting false discovery rate (BH-FDR) to correct for multiple comparisons.
Results: The final sample included 30 older adults with insomnia (67% women, mean age=68.0 [SD 6.58] years) who self-identified as White (80%), Black (17%) and American Indian (7%) race. Greater IS (t=2.82, p=0.011), RA (t=2.59, p=0.018), and L5 (t = 2.61, p=0.017) were associated with greater cognitive flexibility. Of parametric RARs, greater amplitude (t = 2.53, p=0.020) and acrophase (t=2.67, p=0.015) were also associated with greater cognitive flexibility. No other significant associations were observed for any cognitive domain.
Conclusion: Circadian RARs were associated with cognitive flexibility but not other cognitive domains. These findings highlight the potential importance of circadian RAR parameters among older adults with insomnia and provide further support for cognitive flexibility as a key cognitive outcome among older adults with sleep problems.
Support (if any): Merck Investigator Studies Program (#59170).

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0682

CIRCADIAN REST/ACTIVITY RHYTHMS ARE ASSOCIATED WITH DAYTIME SYMPTOMS AMONG OLDER ADULTS WITH INSOMNIA

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Introduction: We investigated the association between circadian rest/activity rhythms (RARs) and daytime insomnia symptoms among older adults with insomnia. We hypothesized that: 1) RARs differ between older adults with insomnia and healthy sleepers; and 2) among older adults with insomnia, RARs are associated with daytime insomnia symptoms.

Methods: Older adults with insomnia (n=30) and healthy sleepers (n=33) were recruited from a tertiary academic medical center. Nonparametric RARs were derived from actigraphy data over 14 days: relative amplitude (RA), interdaily stability (IS), intradaily variability (IV), maximum ten-hour activity (M10) and minimum five-hour activity (L5). Secondary parametric RARs included amplitude, acrophase, and midline statistics of rhythm (MESOR). Daytime function was evaluated via the Daytime Insomnia Symptoms Scale (administered via smartphone 4x/day, i.e., 56 assessments per participant) and validated research questionnaires (administered once). Between-groups differences (insomnia vs healthy sleep) were evaluated using t-tests. Among individuals with insomnia, a series of 104 linear regression models examined the association between RARs and daytime symptoms. The Benjamini-Hochberg procedure for correcting false discovery rate (BH-FDR) was used to correct for multiple comparisons.

Results: Relative to healthy sleepers, older adults with insomnia demonstrated significantly lower RA (p=0.028,t=-2.28) and significantly higher L5 (p=0.018,t=2.48). Among older adults with insomnia, IS was positively associated with positive mood (p=0.013, t =2.67) and negatively associated with pre-sleep somatic arousal (p=0.01, t=-3.06). IV was negatively associated with DISS subscales including Alert Cognition (p=0.001, t=-3.64) and Positive Mood (p< 0.001, t=-4.15) and positively associated with Negative Mood (p< 0.001, t=4.74), and Sleepiness/fatigue (p=0.005, t=3.11), as well as validated questionnaires measuring depression (p=0.02, t=2.47), negative mood (p< 0.01, t=3.43), and pre-sleep somatic arousal (p=0.01, t=3.77). M10 was negatively associated with depression (p< 0.0,1 t=-3.29) and anxiety (p=0.01 t=-2.9). Of parametric RARs, amplitude was negatively associated with negative mood (p=0.005, t=-3.08) and depression (p=0.01, t=-2.75), and positively associated with positive mood (p=0.010, t=2.77). MESOR was negatively associated with depression (p=0.02, t=-2.48) and anxiety (p=0.01, t=-2.81).

Conclusion: Among older adults with insomnia, RARs were associated with daytime insomnia symptoms. Future research should examine how to optimize circadian components of therapeutic interventions in insomnia clinical care.

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0683

REST-ACTIVITY PATTERN IN ISOLATED RBD – FROM PRODROMAL STAGE TO ASSOCIATION WITH PARKINSONISM-FIRST PHENOCONVERSION

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Introduction: Previous evidence suggested that the alteration of rest-activity pattern occurred in patients with isolated rapid eye movement behavior disorder (iRBD), a prodromal stage of α-synucleinopathy with implication to future phenoconversion. Nonetheless, it remains unclear whether this rest-activity pattern alteration has already emerged in the prodromal stage of RBD, and whether it would be related to conversion of iRBD into parkinsonism-first or dementia-first subtype of α-synucleinopathy.
Methods: We performed 1) a case-control study to compare the rest-activity pattern measured by 7-day actigraphy among prodromal RBD subjects (n = 21) and their age-, sex-, and body mass index-matched control subjects (n = 52) and patients with iRBD (n = 63); and 2) a longitudinally follow-up study to investigate the predictive value of altered rest-activity pattern to parkinsonism-first or dementia-first subtype of α-synucleinopathy in full sample of patients with iRBD (n = 170). Prodromal RBD subjects were defined as subjects who had recurrent dream-enactment behaviors but with subthreshold REM sleep electromyography activity. Generalized linear model was employed to assess rest-activity pattern in prodromal RBD subjects and competing risk regression model was used to determine the predictive value of rest-activity pattern to RBD phenoconversion.
Results: Similar to patients with iRBD, prodromal RBD subjects had more daytime probable napping (percentage and duration) and lower average weekly activity level and physical activity level during active period as compared to control subjects. Of 170 patients with iRBD, 166 were successfully followed up with a mean follow-up duration of 4.6 years. Lower average weekly activity level, amplitude, and physical activity level during active period were associated with a higher risk of parkinsonism-first subtype of α-synucleinopathy, instead of dementia-first subtype.
Conclusion: Our study found that altered rest-activity pattern has already emerged in prodromal stage of RBD. As for iRBD patients, lower physical activity level and amplitude might serve as predictive markers of parkinsonism-first conversion.
Support (if any): No

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0684

NATIONAL RLS OPIOID REGISTRY: FOUR-YEAR DOSE STABILITY, EFFICACY AND TOLERABILITY

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Introduction: Refractory or augmented restless legs syndrome (RLS) is often treated with opioids. Despite their short-term efficacy, concerns about long-term efficacy, dose stability, and tolerability persist. The National RLS Opioid Registry is a longitudinal, observational study tracking the long-term efficacy, dose stability, and tolerability of opioids for RLS.
Methods: Extensive interviews were conducted with a baseline population of 500, from 44 US states and 4 countries. All participants have a history of therapeutic response to dopamine agonists–a majority experienced augmentation–and take prescribed opioids for RLS (median duration at BL=2-years). Biannual self-report questionnaires track opioid dosage, side effects, RLS severity, and other relevant factors. No clinical guidance or intervention is provided.
Results: At 4-years, 423 participants continue opioid treatment and study participation (5.8% lost to follow-up or withdrew, 2.4% died, 6.6% stopped opioids). Methadone and oxycodone are the two most common opioids (taken by 54.7% and 21.9% of 4-year participants, respectively). Mean RLS severity (baseline IRLS=13.0; 4-year IRLS=13.3) and sleep disturbance (baseline ISI=10.5, 4-year ISI=9.9) were stable from baseline to 4-years in the Registry. Median daily opioid dose is also unchanged, at 30 MME (equivalent to methadone 7.5 mg or oxycodone 20 mg). Opioid doses were increased by 49.4% of participants (median increase=11.3 MME) and decreased by 19.2% (median decrease=10.5 MME). Large dose increases (25-50 MME or >50 MME) occurred in 5.0% and 5.4% of participants, respectively. Several factors were associated with larger dose increases, including switching opioid medications (OR=3.61, 95% CI [1.80-7.27]), under one year on opioids at baseline (OR=2.03, 95% CI [1.00-4.09]), significant baseline depression (PHQ-9>4) (OR=2.57 95% CI [1.27-5.51]), use of opioids for comorbid pain conditions (OR=3.18, 95% CI [1.21-7.89]), dopamine agonist addition (OR=3.06, 95% CI [0.92-8.77]) or discontinuation (OR=3.16, 95% CI [1.13-8.26]) since baseline, and painful RLS at baseline (OR=3.85, 95% CI [1.26-16.79]). Side effect profiles were unchanged from baseline.
Conclusion: Low-dose opioids effectively control severe RLS symptoms over 4-years of observation. Nearly 50% of participants increased their dose, though most changes were small, with larger dose increases associated with specific risk factors.
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0685

OPIOID TREATMENT OF PATIENTS WITH PAINFUL VERSUS PAINLESS RESTLESS LEGS SYNDROME

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Introduction: Recent studies characterized a clinically more severe and painful (compared to painless) form of restless legs syndrome (RLS). Data comparing pharmacological treatments

in patients with painful and painless RLS are scarce. The current study investigated long-term opioid treatment in patients with painful versus painless RLS.
Methods: Data were extracted from the National RLS Opioid Registry, an ongoing observational longitudinal study of adult patients with a confirmed diagnosis of RLS treated with opioids. Painful RLS classification was based on a "Yes/No" response to the question: "Would you consider your RLS to be painful?". Baseline collected data included age, gender, ethnicity, body mass index, education, RLS family history, age at RLS onset, augmentation history, and International RLS Severity Scale (IRLS). Both RLS concomitant treatments (alpha-two-delta, α2δ) ligands; dopaminergic agents, DA) and RLS opioid treatments with daily dose in morphine milligram equivalents (MME) were collected at baseline and after two years.
Results: Data for 447/500 initially enrolled RLS patients (146 painful and 301 painless RLS) were available after two years. Painful (versus painless) RLS patients were less frequently White (94.5% versus 98.3%; P=0.0347) and had more severe RLS symptoms at baseline (IRLS scores: 16.6±10.0 versus 11.3±9.1; P< 0.0001). Frequency of patients on concomitant DAs or α2δ ligands did not differ between the two subgroups at baseline or after two years. The mean daily opioid dose (MME) did not differ between the two subgroups at baseline or after two years. The frequency of patients with MME ≥50 was higher in the painful RLS subgroup at baseline (27.4% versus 18.6%; P=0.0338) but not after two years. Painful RLS patients either increased or decreased opioid dose (65.1% versus 53.2%; P=0.0170) and more frequently switched, added, or discontinued opioids (25.3% versus 15.6%; P= 0.0135) after two years.
Conclusion: Whether the higher need for change in opioid dose or medication in patients with painful RLS is related to the severity of RLS and/or lack of efficacy remains to be determined.
Support (if any): The National RLS Opioid Registry received support from the RLS Foundation, Baszucki Group, and Jerry Blakeley.

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0686
SYSTEMIC EVALUATION OF REM WITHOUT ATONIA ASSOCIATED WITH PSYCHOTROPIC MEDICATIONS

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Introduction: Selective serotonin reuptake inhibitors (SSRIs), Serotonin and norepinephrine reuptake inhibitors (SNRIs), and Tricyclic antidepressants (TCAs) alter REM sleep motor characteristics and have been associated with REM sleep behavior disorder (RBD). We leveraged a large cohort of polysomnograms (PSGs) to analyze the relationship of SSRI, SNRI, and TCA use on REM without atonia (RWA).
Methods: We analyzed 1075 PSGs from the Cleveland Clinic Starlit Registry with >10% total sleep time in REM sleep systematically scored for RWA using AASM 2.6 criteria. Percent of REM epochs meeting RWA criteria in PSGs without medication use were compared with the following medication groups: SSRI (N=303), SNRI (N=142), TCA (N=49), and combinations SSRI+SNRI (N=8), SSRI+TCA(N=11) and SNRI+TCA (N=7). We performed a linear regression analysis using the Ordinary Least Squares (OLS) method from the SciPy library (v1.11.1) to measure the association of RWA epochs by medication group adjusting for age, body mass index (BMI), and gender.
Results: Our sample included 48.2% females with a mean age of 52.7 (SD:16.7) and a mean BMI of 32.6 (8.6). The overall mean percentage of RWA epochs was 11.7 (SD:17.5), with a median, 25% and 75% of 4.1, 0.5, and 14.8, respectively. SSRI and SNRI use was associated with a 4.7% and 7.0% increase in RWA (p=< 0.001), respectively, while a 13.6% increase was observed in the SSRI+SNRI group (p= 0.02). Although the TCA and TCA+SSRI groups were associated with only 1.8% and 5.4% increases, they were not significant (p=0.48 and 0.29). The TCA + SNRI group was associated with an increase of 18% (p=< 0.001).
Conclusion: Use of SSRIs and SNRIs alone or in combination, and TCAs combined with SNRI increase the percentage of REM epochs meeting criteria for RWA. Although TCAs alone and combined with SNRIs were not associated with significant increases, this may be due to small sample sizes. These results suggest a potential synergistic effect on RWA criteria in patients using psychotropic medications that necessitates further study. This research has important implications for the diagnostic criteria for RWA and the diagnostic accuracy of RBD.
Support (if any): We acknowledge the support of NIH grant R21HL170206.

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0687
RLS TREATMENT REDUCES NIGHTTIME AGITATION AND INCREASES SLEEP DURATION IN OLDER ADULTS WITH ALZHEIMER'S DISEASE

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Introduction: Nighttime agitation is a prevalent, distressing symptom in persons with dementia. We hypothesized that restless legs syndrome (RLS), a sensorimotor disorder of uncomfortable leg sensations that worsen at night, might precipitate nighttime agitation. The purpose of this study was to determine the effect of gabapentin enacarbil (GEn), an FDA approved medication for RLS, versus placebo on nighttime agitation and sleep.
Methods: We conducted an 8-week, double-blind, randomized trial of GEn versus placebo involving 147 older adults with dementia due to Alzheimer's disease, nighttime agitation, and RLS (diagnosed by experts using the Behavioral Indicators Test Restless Legs). The primary endpoint was the Cohen-Mansfield Agitation Inventory, Direct Observation. Multivariable linear mixed effects regression models based on multiply imputed data were estimated on repeated measures of nighttime agitation and sleep, with treatment group, week, the two-way interaction of group x week as predictors, and mean arterial pressure as a covariate based on baseline group imbalances.
Results: Mean age was 83.4 ± 9.1 years. Most were female (72.0%), White (92.3%), non-Hispanic (84.6%), and lived in nursing homes (76.9%). Nighttime agitation by group over time was significant at 2 (Estimate = -2.21, p = 0.002) and 8 weeks (Estimate -2.13, p = 0.004). Total sleep time (actigraphy) by group over time was significant at 8 weeks (Estimate = 48.45, p = 0.026), but not 2 weeks (Estimate = 33.39, p = 0.091). Nighttime wake by group over time was significant at 2 (Estimate = -12.54,

p =0.006) and 8 weeks (Estimate = -11.12, p = 0.015). Results were not significantly different by sex, race or ethnicity. The number having one or more adverse events was: GEn 60 (81.1%) and placebo 50 (68.5%). Five events in the GEn group, and 8 in the placebo group were severe. The GEn group had more falls than the placebo group (Mean: 1.3 vs 0.7, p =0.066).
Conclusion: Our results clearly show that RLS is an unrecognized cause for nighttime agitation in older adults with dementia and that treatment of RLS with GEn, compared to placebo, significantly reduced nighttime agitation and improved sleep.
Support (if any): R01AG051588 UL1TR003015 Arbor - Horizant and placebo

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0688

POST-ILLUMINATION PUPILLARY RESPONSE (PIPR) IS ATTENUATED IN PATIENTS WITH REM-SLEEP BEHAVIOUR DISORDER

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Introduction: Circadian disruptions are conspicuous in patients with Parkinson's disease (PD). Previous study showed that melanopsin-mediated post-illumination pupillary response (PIPR) was attenuated in patients with PD. iRBD is often regarded as a prodromal phase of PD, but it remains unclear whether there is an early emergence of changes in PIPR in patients with iRBD.
Methods: This case-control study compared the PIPR, sleep and circadian parameters among controls and patients with iRBD. PIPR was measured by DP-2000 pupillometer (NeurOptics, Irvine, CA, USA). Post-stimulus continuous pupil size recording for 60s was conducted after a 1-second blue stimulus (467nm, 2.0log lux) and a 1-second red light stimulus (632nm, 2.0 log lux), respectively, with 2 minutes of dark adaptation in between. The PIPR was defined as the pupil size at 6s post-stimulus, normalized to the baseline pupil diameter. Net-PIPR is calculated by subtracting PIPR-red from PIPR-blue. One-week actigraphy, sleep diary data and an overnight urinary 6-sulfatoxymelatonin (aMT6s) sample (except those on exogenous melatonin) were also collected. Group difference was compared by Chi Square test or t-test where appropriate. Linear regression analyses were conducted to examine the relationship between PIPR and other circadian parameters.
Results: At present, 50 controls (Age, mean±standard deviation: 62.9±7.1 years) and 37 patients with iRBD (64.4±5.4 years) were recruited. The Net-PIPR was significantly attenuated in the iRBD group (19%±0.11 vs 26%±0.11, p=0.003). Net-PIPR has significant association with aMT6s (B=0.13, 95% Confidence interval (CI)=0.05-0.21, p=0.001), actigraphic M10 (B=2.6, CI:0.8,4.4, p=0.005), mesor (B=1.5, CI: 0.48-2.51, p=0.005), and amplitude (B=1.1, CI:0.2 - 2.1, p=0.02), while controlled for age, gender, photoperiod, time since awake, use of medication. A higher PIPR was associated with a lower odds for iRBD (Odd ratio=0.03, CI:0,89,0.99,p=0.014), adjusted for age, gender, photoperiod, and MOCA score.
Conclusion: Our results showed that PIPR is attenuated in patients with iRBD and is associated with other markers of circadian disruptions. The study supported the early emergence of circadian disruptions in iRBD patients and PIPR is a potential convenient non-invasive circadian marker. Further longitudinal study is needed on whether PIPR would predict circadian disruption and future neurodegeneration.
Support (if any): Direct grant of The Chinese University of Hong Kong (Ref. 2021.054)

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0689

AUTOMATED DETECTION OF ISOLATED REM SLEEP BEHAVIOUR DISORDER USING COMPUTER VISION

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Introduction: Isolated Rapid Eye Movement (REM) Sleep Behavior Disorder (iRBD) is a marker of neurodegeneration and is currently diagnosed based on REM sleep without atonia (RSWA) and a history of dream enactment. However, even for sleep experts, scoring RSWA can be challenging and incidental RBD cases are easily missed. Previous research focused on the automatic identification of iRBD using 3D video analysis. This study aims at developing a machine learning classifier to detect iRBD using only conventional 2D cameras and evaluating its performance on an expanded cohort.
Methods: We used 2D video data from in-lab video-polysomnography recorded at the Stanford Sleep Center in 78 patients with definite iRBD per ICSD-3 TR criteria and 109 without RBD (41 OSA [AHI > 15], 37 RLS/PLM [PLMi>15], 9 non-RBD parasomnias, 5 insomnia, 2 narcolepsy, 39 with normal sleep). An automatic computer vision algorithm, i.e. optical flow, was applied on the recorded videos to detect periods of movements in REM sleep. Movement periods were divided based on their duration from very brief (0.1s) to extended (>30s) motor behaviors, 1 second of immobility separating each period. Features were movement frequency and proportion of movement periods in REM sleep. Different combinations of these features fed a logistic regression classifier, which was trained and tested in the 10-fold cross-validation scheme.
Results: On average, 58.13 and 42.53 movement periods were detected during REM sleep in cases and controls, respectively. The best performance was achieved using short movements (0.1-2s) with sensitivity of 0.921, specificity of 0.674, accuracy of 0.835 and F1 score of 0.847. With medium (2-15s) and long (15-300s) movements, accuracy was 0.845 and 0.672, sensitivity 0.743 and 0.147, specificity 0.901 and 1.0, and F1 score 0.808 and 0.256, respectively. Adding features of gender, AHI, and PLM index to short movements increased accuracy to 0.886.
Conclusion: One-night video data from conventional video-polysomnography can detect iRDB using machine learning techniques. Automated video analysis of REM sleep could augment our current ability to screen and diagnose RBD in the sleep laboratory setting.
Support (if any):

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0690

CLINICAL OUTCOMES IN ADULTS WITH COMORBID RESTLESS LEGS SYNDROME AND OBSTRUCTIVE SLEEP APNEA (CO-ROSA)

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Introduction: Obstructive sleep apnea (OSA) and restless legs syndrome (RLS) both significantly influence important measures of health in adults. The Patient Health Questionnaire (PHQ-9), Epworth Sleepiness Scale (ESS), Insomnia Severity Index (ISI), and Generalized Anxiety Disorder 7 (GAD-7) questionnaires assess depression, sleepiness, insomnia, and anxiety symptoms, respectively. We hypothesized that patients with comorbid RLS and OSA (CO-ROSA) will show worse scores in the above-mentioned questionnaires, than patients with OSA alone.
Methods: In this observational cross-sectional study, we administered PHQ-9, ESS, ISI, GAD-7 to adult patients with OSA and patients with CO-ROSA, both treated with CPAP, at a single academic sleep center. Inclusion criteria: presence of OSA or CO-ROSA treated with CPAP. Exclusion criteria: diagnosis of narcolepsy, REM behavior disorder, dementia, or unable to communicate (answer the questionnaire). Data collected included demographics (age, sex, self-reported ethnicity), presence of comorbid restless legs syndrome, and polysomnographic data. SPSS was used to obtain descriptive statistics, independent T-Tests, and Pearson correlation. P-values of < 0.05 were significant.
Results: A total of 133 patients were included in the study, 53.4% had OSA alone (OSA) and 46.6% had Co-ROSA. Demographics: White 62.3%, Latino 27.4, Black 5%, and Asian 1.4%. 37% of Latino and 45 % of whites had CO-ROSA. There were no statistically significant differences in age, AHI, polysomnographic parameters, and CPAP adherence between OSA and CO-ROSA groups. Patients with CO-ROSA had higher PHQ-9 scores (8.2±5.1) than patients with OSA alone (5.2±5.6) and higher ESS (9.5 ±5.7) than OSA (5.9±4.5); ($p< 0.05$); The following did not reach statistical significance: ISI in OSA (14.85±7.9) and CO-ROSA (14.57±6.1); GAD-7 in OSA (4.29±5.1) and CO-ROSA (5.76±4.5). Latino participants had lower PHQ-9 scores (4.71±4.9), $p< 0.05$. There were no correlations between any of the questionnaire scores with age, severity of OSA, compliance, or polysomnographic parameters.
Conclusion: Patients with CO-ROSA have statistically significant worse measures of depression and sleepiness than those with OSA alone despite equal compliance, age, polysomnographic parameters, and OSA severity. Both groups had elevated ISI scores. As a whole group Latino patients had lower symptoms of depression.
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0691

HIGH PREVALENCE OF PERIODIC LIMB MOVEMENTS OF SLEEP WHILE USING HYPOGLOSSAL NERVE STIMULATION THERAPY

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Introduction: Periodic limb movements of Sleep (PLMS) often accompany obstructive sleep apnea (OSA) and significantly impact the quality of sleep and treatment adherence. As a novel treatment for OSA, it is crucial to understand the presence and potential impact of PLMS in patients undergoing hypoglossal nerve stimulation (HNS) therapy. Nevertheless, no study to date has investigated PLMS among those in HNS therapy.
Methods: Subjects receiving HNS therapy from December 2020 to August 2023 were consecutively included for this retrospective cohort analysis. PLMS diagnosis was based on periodic limb movement index (PLMI) ≥ 15. Prevalence of PLMS was the main outcome measure and then we compared biometric/demographic data, comorbidities, medications, data from HNS fine-tune polysomnography (PSG), pre- and post-HNS Epworth Sleepiness Scale (ESS), and baseline OSA parameters between two groups: PLMS versus no PLMS. Statistical analyses were performed using STATA.
Results: One hundred subjects were included for the analysis. The average age was 66.7, with 75% being male, and 82% being non-Hispanic White. Significant PLMS was shown in 52 among 100 subjects receiving HNS treatment. The PLMS group was older (69.0 vs. 64.2 years old, $P = 0.008$); however, there was no difference observed in terms of sex, race, co-morbidities including depression and anxiety, use of selective serotonin reuptake inhibitors/serotonin and norepinephrine reuptake inhibitors, dopamine agonists, or alpha-2-delta ligands. The PLMS group had lower pre-HNS ESS score (7.3 vs. 9.4, $P = 0.018$), and higher baseline non-supine apnea-hypopnea index (AHI) (22.5 vs. 12.9, $P = 0.030$); however, there were no differences of HNS fine-tune PSG parameters including non-supine AHI (6.6 vs 4.2, $P = 0.505$), maximum tolerated voltage, HNS usage, and subjective benefit.
Conclusion: The prevalence of PLMS among OSA patients with HNS therapy is notably high at 52%. This high prevalence of PLMS may be attributed to the negative impact of PLMS on CPAP adherence leading to the HNS therapy. Despite the high prevalence of PLMS, PLMS did not result in HNS treatment short-term outcome difference. Further study is needed to investigate the effect of HNS on PLMS and a longer-term impact of PLMS in HNS treatment outcome.
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0692

MEDICATION USE AND RESTLESS LEGS SYNDROME IN PREGNANCY AMONG NULLIPAROUS WOMEN

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Introduction: Several antiemetics and antidepressants have been associated with the exacerbation of restless legs syndrome (RLS) in non-pregnant adults. Whether this relationship exists among pregnant individuals is uncertain. We investigated whether taking potentially RLS-exacerbating medications during pregnancy is associated with a higher likelihood of RLS symptoms.
Methods: In this prospective study conducted at 8 U.S. sites, structured questions were utilized to capture all medications taken in early (during pregnancy until study visit 1 (6-13 weeks)) and mid-pregnancy (between study visits 2 (16-21 weeks) and 3 (22-29 weeks)). The use (yes/no) of five categories of potentially

RLS-exacerbating medications was determined: first-generation antihistamines, serotonergic antidepressants, dopamine antagonists, tricyclic antidepressants, and mirtazapine. Primary outcome variables were the presence of RLS symptoms at study visits 1 and 3, determined by a questionnaire based on International RLS Study Group diagnostic criteria. Poisson regression with robust standard errors estimated the relative risk of RLS symptoms by medication use. Multivariable models included a priori covariates of age, race and ethnicity (as socially constructed variables), and recent tobacco use.
Results: Of 8,057 participants (age 27.2±5.4 years) who completed both medication-use and RLS questionnaires at least once, 12% and 8.7% took potentially RLS-exacerbating medications in early and mid-pregnancy, respectively. The most frequent medications were first-generation antihistamines (early: 6.6%, mid: 5.3%) and serotonergic antidepressants (early: 4.6%, mid: 3.1%), followed by dopamine antagonists (early: 1.7%, mid: 0.9%). Few participants (≤0.2%) used tricyclic antidepressants or mirtazapine. The prevalence of RLS symptoms was 18% in early pregnancy and 31% in mid-pregnancy. After multivariable adjustment, first-generation antihistamine use was associated with a higher prevalence of RLS symptoms in early (adjusted relative risk [aRR], 1.29; 95% confidence interval [CI], 1.08-1.54; p=0.005) and mid-pregnancy (aRR, 1.17; CI, 1.01-1.36; p=0.042). Similarly, serotonergic antidepressant use was associated with a higher prevalence of RLS symptoms in early (aRR, 1.83; CI, 1.55-2.17; p< 0.001) and mid-pregnancy (aRR, 1.25; CI, 1.05-1.50; p=0.013). No association was found between dopamine antagonists, tricyclic antidepressants, or mirtazapine and RLS symptoms.
Conclusion: There was a higher prevalence of RLS symptoms in people taking first-generation antihistamines or serotonergic antidepressants during pregnancy.
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0693

POLYSOMNOGRAPHIC FEATURES OF SLEEP PARALYSIS

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Introduction: We report the electroencephalography (EEG) changes observed in a case of sleep paralysis.
Methods: We present the case of a 15-year-old boy with recurrent isolated sleep paralysis. As part of the diagnostic evaluation, the patient underwent overnight polysomnography (PSG) and subsequently, a multiple sleep latency test (MSLT). During the MSLT, the patient experienced sleep paralysis, which was captured on the EEG and is detailed in this report.
Results: In Epoch 27 (30-second segments), the patient exhibited rapid eye movement (REM) sleep. In Epoch 28, while maintaining REM atonia (observed on the chin EMG channel), faster EEG frequencies intruded in the middle of the epoch. In Epoch 29, rapid eye movements and REM atonia persisted, accompanied by EEG patterns displaying faster frequencies and alpha waves consistent with a wakeful state. Sleep paralysis, lasting approximately 48 seconds, was documented from the middle of Epoch 28 to the end of Epoch 29. In Epoch 30, the patient transitioned to wakefulness, reporting the occurrence of sleep paralysis. The EEG during this epoch demonstrated the return of normal awake brainwave patterns.
Conclusion: REM sleep is often associated with vivid dreaming and muscle atonia. During episodes of sleep paralysis, an overlap of characteristics of REM sleep, including theta waves typically seen during REM sleep, and the presence of alpha brain waves indicative of relaxed wakefulness. The convergence of REM features and alpha waves underscores the mixed state of consciousness experienced during sleep paralysis episodes. These findings contribute to a better understanding of the complex neurophysiological changes associated with sleep paralysis.
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0694

REM DENSITY IN PATIENTS WITH IDIOPATHIC PARKINSON'S DISEASE WITH AND WITHOUT REM SLEEP BEHAVIOR DISORDER

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Introduction: Previous studies have reported reduced rapid eye movement density (REM density) in idiopathic Parkinson's disease (PD). It remains unclear how REM density in PD differs between those who have or do not have REM Sleep Behavior Disorder (RBD). The objective of this study was to investigate whether REM density differs in patients with PD with and without RBD.
Methods: A sample of fourteen patients with PD were enrolled in a cross-sectional study at Virginia Commonwealth University and underwent one-night polysomnography (PSG). Five of fourteen patients had dream enactment behavior and REM sleep without atonia on PSG and were diagnosed with RBD. REM eye movements were visually inspected by two sleep medicine specialists. REM density was defined as the number of rapid eye movements per minute of REM sleep. Mean and standard deviation for the REM density, total sleep time (TST), stage REM (R) percentage and total apnea-hypopneas indices (AHI) were calculated. Two-tailed T-tests were used to compare the means between the two groups.
Results: For PD without RBD, the mean REM density was 2.3±1.6, mean stage R percentage was 20.1% ±5.5, mean TST was 351.3±72.1 minutes, and mean AHI was 4.1± 4.0. For PD plus RBD, mean REM density was 6.8±1.9 minutes, mean stage R percentage was 20.9% ±9.6, mean TST was 307.6±72.3 minutes, and mean AHI was 1.5 ±3.3. The mean REM density was significantly greater in PD with RBD compared to PD without RBD (P < 0.001). There was no statistical significance of the means of TST, R percentage, and AHI across the two groups.
Conclusion: Our results show that PD patients with RBD have increased REM density compared to PD patients without RBD, a similar finding to prior studies. Future evaluations and further research open the possibility for REM density as a potential diagnostic biomarker.
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0695

RESIDUAL PERIODIC LIMB MOVEMENT INDEX AFTER CPAP TITRATION IS CORRELATED WITH HYPOXEMIA

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Introduction: Periodic limb movement of sleep (PLMS) are commonly seen in patients with obstructive sleep apnea (OSA) . There are few studies that have assessed the persistence of PLMS in patients with OSA, treated with continuous positive airway pressure (CPAP). In the current study we analyzed PLMS outcomes in split studies and found correlates.

Methods: Retrospective chart review of adult patients undergoing split studies. Demographics, diagnostic and titration polysomnographic data was collected. Groups were divided in four: group 1 had normal index of PLMS (< 15) on both portions of the sleep study, group 2 had elevated periodic limb movement index (PLMI) >15, but did not change with treatment, group 3 had worse PLMI on titration, group 4 had resolution of PLMI during titration portion.

Results: A total of 138 patients were included (62.8% male, 37.2% female). age±SD was not statistically significant between groups, Group 1 (40.6% of patients) with mean age 56.4±14.5, group 2 (17.9%) mean age 51.3±15.6, group 3 (13.1%) mean age 65.1±12.1 and group 4 (28.3%) mean age 60.4±9.8. PLMI was different among groups (p< 0.001) both during diagnostic and titration. During diagnostic PLMI Group 1 was 3.8±4.7, group 2 was 56.8±29.7, group 3 was 11.9±9.9 and group 4 was 55.5±36.8. During treatment portion PLMI group 1 was 2.6±4, Group 2 was 64.9±35.7, group 3 was 55±31.9 and group 4 was 8.9±9. None of the sleep parameters were statistically significant between groups except the time spent with saturation below 88% (p< 0.05) With the normal group (1) and group 4 having the least time below 88%. Group 1: 11.5±18 minutes, group 4 spent 11.5±18 minutes. While group 2 spent 36.6±41.2 and group 3 spent 26.3±25.7 minutes. There was a moderate Pearson correlation of 0.384 (CI 0.206-0.538) between saturation time below 88% and PLMI in the titration portion.

Conclusion: An elevated PLMI was present in 59.4% of patients with OSA undergoing split studies. Resolved in 28.3% and worsened in 13.1%. The group with no change in PLMI (group 2) had that worse PLMI and worse hypoxemia. PLMI was moderately correlated with time spent with saturation below 88%.

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0696

SLOW-WAVE SLEEP AND REM SLEEP WITHOUT ATONIA PREDICT MOTOR PROGRESSION IN PARKINSON'S DISEASE

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Introduction: Growing evidence supports the potential role of sleep in the motor progression of Parkinson's disease (PD). Slow-wave sleep (SWS) and rapid eye movement (REM) sleep without atonia (RWA) are important sleep parameters. The association between SWS and RWA with PD motor progression and their predictive value have not yet been elucidated.

Methods: We retro-prospectively analyzed clinical and polysomnographic data of 136 patients with PD. The motor symptoms were assessed using Unified Parkinson's Disease Rating Scale Part III (UPDRS III) at baseline and follow-up to determine its progression. Partial correlation analysis was used to explore the cross-sectional associations between slow-wave energy (SWE), RWA and clinical symptoms. Longitudinal analyses were performed using Cox regression and linear mixed-effects models.

Results: Among 136 PD participants, cross-sectional partial correlation analysis showed SWE decreased with the prolongation of the disease course (P = 0.046), RWA density was positively correlated with Hoehn & Yahr (H-Y) stage (tonic RWA, P < 0.001; phasic RWA, P = 0.002). Cox regression analysis confirmed that SWE (HR = 1.739, 95% CI = 1.038-2.914; P = 0.036) and tonic RWA (HR = 0.575, 95% CI = 0.343-0.963; P = 0.032) were predictors of motor symptom progression. Furthermore, we found that lower SWE predicted faster rate of axial motor progression (P < 0.001) while highertonic RWA density was associated with faster rate of rigidity progression (P = 0.006) using linear mixed-effects models.

Conclusion: These findings suggest that SWS and RWA might represent markers of different motor subtypes progression in PD.

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0697

DIAGNOSIS DELAY AND FAILED RECOGNITION OF RBD: FROM "FITS TO PARKINSON'S DISEASE"

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Introduction: The diagnosis of REM sleep behavior disorder (RBD) requires the presence of dream enactment behaviors (DEB) and polysomnographic confirmation of REM sleep without atonia (RWA). Recent data illustrates a significant diagnostic delay from the onset of DEB until the formal diagnosis of RBD. The North American Prodromal Synucleinopathy (NAPS) Consortium was established to prospectively follow a clinic-based cohort to better understand baseline characteristics of patient with RBD at diagnosis, help uncover predictors of phenoconversion, and enable early-stage clinical trial enrollment. We sought to measure the extent of diagnostic delay within our UCLA NAPS cohort and identify common misdiagnoses on initial presentation to confirmation of diagnosis.

Methods: Retrospective review of patients in the UCLA NAPS Cohort. Results are reported as mean ± standard deviation.

Results: We identified 32 patients, 24 (75%) male and 8 (25%) female, with an age range of 32 to 85 in a cohort of patients who were diagnosed with RBD between 2012 and 2023. Mean age of DEB onset was 52.2 ± 15 years. Mean age of RBD diagnosis was 60.2 ± 13 years. Average time from DEB presentation to RBD confirmation by PSG was 8 ± 9 years. There was no significant difference in diagnostic delay between male and female (8.9 ± 9 v. 8.9 ± 9 years, respectively; p=0.89). Diagnoses given at time of presentation included sleep (night) terrors (n=12), nightmares (n=7), anxiety/panic (n=4), severe obstructive sleep apnea (n=2), RBD (n=2), Parkinson's disease (n=1), and food-borne illness (n=1).

Conclusion: Our data reveals pervasive and significant delay in time from initial presentation of dream enactment to the formal diagnosis of RBD. Enhancing primary clinicians' education and competency in recognition of RBD and knowing when to refer patients suspected of having RBD is a critical step to address this gap.
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0698

EXPLORING AGE- AND SEX-SPECIFIC CHANGES IN PLMS IN RLS: AN EMPHASIS ON POSTMENOPAUSAL WOMEN

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Introduction: This study aimed to investigate whether women experiencing restless legs syndrome (RLS) undergo distinct changes in periodic leg movements during sleep (PLMS) during the post-menopausal period, using an age threshold of >50 years as a proxy, in comparison to men of the same age. The assessment of leg movement activity during sleep employed a method that utilized indexes specifically designed for evaluating leg movement periodicity.
Methods: We enrolled a total of 103 participants, 36 of them were aged 18-50 years, comprising 19 men (median age: 40 years) and 17 women (median age: 37 years). Additionally, 67 participants were >50 years old, including 24 men (median age: 66.6 years) and 43 women (median age: 60.0 years). Full night PSG were obtained in all subjects which were scored following standard criteria.
Results: Significant differences were not observed between men in the two age groups. However, in women, a noteworthy and statistically significant increase in the periodicity index was evident in the older group, accompanied by a decrease in isolated leg movements. The intermovement interval graphs revealed a clear age-related enhancement of PLMS in women, particularly in the 16-22 second range, surpassing the changes observed in men. These findings remained consistent when the analysis was replicated by comparing subjects aged 18-45 years with those aged >55 years.
Conclusion: Our results underscore the clinical relevance of evaluating PLMS in postmenopausal women, as these changes are likely associated with the hormonal fluctuations characteristic of this life stage. Translationally, recognizing and addressing PLMS in postmenopausal women is imperative for optimizing their sleep health and mitigating potential health risks associated with sleep disturbances. This study contributes to the broader understanding of RLS and emphasizes the need for targeted interventions in this specific demographic group.
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0699

FREQUENCY OF SLEEP PARALYSIS AS RELATED TO LIFESTYLE VARIABLES IN A NATIONWIDE STUDENT SAMPLE: PRELIMINARY FINDINGS

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Introduction: Sleep Paralysis (SP) is a sleep-disturbing experience of muscle atonia while conscious, creating an in-between sensation of wakefulness and dissociation during REM sleep. During SP, one can experience hypnagogic and hypnopompic hallucinations, which may cause feelings of terror and fear. These feelings affect the overall well-being of the experiencers and may impact other aspects of their lives. We investigated factors that may influence the frequency of SP in university students.
Methods: Participants (N=158, 65.19% female, 5.7% non-binary/third gender, 64% white) completed a mixed method, retrospective nationwide survey including items querying demographic variables, lifestyle (i.e., substance use, technology use, social media use), sleeping behaviors (i.e., napping, habitual bedtime, sleep interruption), sleep quality, and frequency of SP.
Results: For questions relating to SP frequency among the 7 categories, most respondents experienced SP "Several" times (36%, N=45, while 14.4% (N=18) experienced SP "Once" and 3.2% (N=4) experienced SP "Daily." When comparing daily SP experiencers (DSP) to one-time SP experiencers (OSP), 75% (N=3) of DSP napped 4-7 times per week, while half of the OSP (N=9) napped only 1-3 times per month. In our qualitative analysis, many respondents stated they experienced SP most during "napping." Additionally, the majority of non-SP experiencers (N=18) answered "Never" or "Less than once a month" for napping. For alcohol use, 75% of DSP (N=3) answered "Yes" to "Do you drink alcohol?" while only 55% of OSP (N=10) answered "Yes." This study could not find differences in caffeine or nicotine use.
Conclusion: Our results suggest that there is a difference in sleeping and lifestyle behaviors between students who experience SP frequently and students who experience SP once or not at all. The most significant difference in the sleeping behaviors is the frequency of napping. The direction of causation between the frequent napping behavior and the SP remains to be determined. Among lifestyle behaviors, SP frequency data suggests that drinking frequency may moderately predict SP. More research is needed regarding whether phone use and/or social media may influence SP frequency, as such behaviors have been shown to influence sleep timing, time duration, and quality.
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0700

IDENTIFYING RAPID EYE MOVEMENT SLEEP BEHAVIOR DISORDER IN VETERANS ADMINISTRATIVE DATABASES: A VALIDATION STUDY

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Introduction: As a first step toward phenotyping large numbers of Veterans with rapid eye movement (REM) sleep behavior disorder (RBD), we investigated the ability of ICD-9 (327.42) and ICD-10 (G47.52) codes to detect Veterans with this clinical diagnosis.
Methods: Subjects were 150 randomly selected Veterans with relevant RBD ICD codes for at least 2 outpatient encounters or 1 inpatient discharge (+RBDcode). Notes from the date of the first ICD diagnosis were reviewed for any documentation of RBD, dream enactment behaviors (DEBs), and targeted pharmacotherapy. The nearest diagnostic, split night, or titration polysomnogram (PSG) report was also reviewed. To calculate sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) for probable RBD, a comparison group of 50 Veterans with at least 2 outpatient visits or 1 inpatient discharge summary with ICD-9/ICD-10 codes for OSA and no ICD codes for RBD (-RBDcode) were propensity-matched for age, sex, gender, race, ethnicity, and month-year of first diagnosis.
Results: The final sample consisted of 139 Veterans in +RBDcode (age 64.8±15.2, 94.6% male, 69.8% white, 10% Hispanic) and 47 Veterans in -RBDcode (age 69.6±2.7, 95.8% female, 77.1% white, 4.3% Hispanic) after excluding subjects with unavailable or restricted charts. In +RBDcode, a diagnosis of RBD, overt DEBs, and targeted pharmacotherapy were documented in 130 (93.5%), 103 (74.1%), and 71 (51.1%) of subjects, respectively. No PSGs were documented in 71 (51.5%), reports did not comment on REM sleep without atonia (RSWA) in 29 (20.9%), and REM did not occur in 8 (5.8%) subjects. Only 13 (9.3%) had documented DEBs and a PSG with RSWA. No subjects in -RBDcode had documentation of pRBD. The sensitivity, specificity, PPV, and NPV for pRBD was 100%, 83.9%, 93.5%, and 100%, respectively.
Conclusion: ICD-9 and ICD-10 codes accurately predicted the presence (or absence) of pRBD compared to manual chart review. Next steps are to phenotype Veterans with RBD diagnoses according to comorbidities and outcomes on a nation-wide scale.
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0701

PERCEIVED EXERCISE RESPONSE HETEROGENEITY IN ADULTS WITH RESTLESS LEGS SYNDROME

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Introduction: Restless legs syndrome (RLS) is a prevalent, sensorimotor sleep disorder that is temporarily relieved by movement. There is evidence of inter-individual variation in the response to exercise (i.e., response heterogeneity). We examined factors that may account for inter-individual differences in perceived response to exercise as a mode of treatment for RLS symptoms.
Methods: Participants (N=528) completed a mixed-methods survey including items assessing RLS outcomes, physical activity levels, and personal experiences with exercise. Participants were classified as "perceived responders" (i.e., exercise impacts symptoms) and "perceived non-responders" (i.e., exercise does not impact symptoms). Perceived responders were further classified as "positive responders" (i.e., exercise improves symptoms) or "negative responders" (i.e., exercise exacerbates symptoms). In this pilot study, an XGboost classifier was used to predict responsiveness to exercise based on clinical and demographic characteristics. Two binary models were implemented, one for non-responders vs responders (M1) and the other for positive responders vs. negative responders (M2). Each model datasets were split into training and test sets.
Results: There were no significant differences in demographic or clinical characteristics between perceived responders (n=450) and perceived non-responders (n=76). Perceived positive responders (n=172) reported significantly lower BMI, overall RLS severity, and had a lower proportion of people with periodic limb movements than perceived negative responders (n=72). M1 classifier resulted in weighted F1 score, sensitivity, and specificity of 0.92, 0.92 and 1 for training and 0.83, 0.8, 0 for testing, respectively. Whereas the M2 classifier resulted in a weighted F1 score, sensitivity, and specificity of 0.9, 0.90, 0.95 for training and 0.6, 0.79, 0 for testing, respectively. XGBoost feature importance ranked RLS pregnancy incidence, RLS time onset (morning, afternoon), total RLS severity score, physical activity level, BMI, age, and sedentary time as most important.
Conclusion: The present study reveals factors that correlate with individual differences in response to exercise for people with RLS. If confirmed, such individual differences and specific attributes may be useful to optimize individual treatment plans that include exercise as a recommendation.
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0702

PERIODIC LIMB MOVEMENTS IN SLEEP MAY CONTRIBUTE TO REM PARASOMNIA

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Introduction: Parasomnias are characterised by increased number of arousals. Periodic limb movements in sleep may fragment the sleep; therefore, may trigger parasomnias. However, the association is poorly understood.
Methods: As part of a retrospective service evaluation project, we investigated 131 patients who underwent a full night attended polysomnography due to reported history of parasomnias. Patients were divided into two groups, depending on their periodic limb movements in sleep index (PLMI≥15/h).
Results: Forty-three patients (32%) had PLMS. They more commonly complained about dream enactment (51 vs. 26%, $p< 0.01$), abnormal movements (59 vs. 39%, $p=0.04$) and sleep paralysis (11 vs. 1%, $p< 0.01$) and less likely experienced sleep walking (22 vs. 40%, $p=0.04$). There was no difference in sleep eating (8 vs. 10%), sexsomnia (0 vs. 2%), nightmares (24 vs. 21%), night terrors (8 vs. 21%), or confusional arousals (17 vs. 30%). Overall, they more likely had a diagnosis of REM parasomnia (71 vs. 50%, $p=0.03$) and were less likely diagnosed with non-REM parasomnia (45 vs. 70%, $p< 0.01$). PLMI significantly related to arousal index ($\rho=0.37$, $p< 0.01$) and arousal index from NREM

(ρ=0.38, p< 0.01); however interestingly, there was no relationship with arousal index from REM (ρ=0.13, p=0.13).
Conclusion: Periodic limb movements in sleep are common in patients with parasomnia and are associated with REM parasomnias. Further studies are necessary to investigate if treatment of PLMS could be beneficial in patients with REM parasomnias.
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0703

CATCH-UP WEEKEND SLEEP DURATION IS ASSOCIATED WITH ABNORMAL BEHAVIOR DURING SLEEP IN ADOLESCENTS

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Introduction: Studies focusing on the association between sleep habit and parasomnia in adolescents are relatively scarce compared to other age group. Our study aimed to investigate the association between sleep duration and abnormal behavior during sleep (ABS) in Korean adolescents.
Methods: In this cross-sectional study, we evaluated 25,789 adolescents between 12 and 18 years of age (mean 15.76 ± 1.73 years; male 48.51%). Global Sleep Assessment Questionnaire and self-report questionnaires were used to assess ABS, sleep habits including catch-up weekend (CUW) sleep duration, and various socio-behavioral factors as covariates.
Results: The prevalence of ABS was 3.39% (n = 873). The analyses of multivariate logistic regression of the adjusted OR for ABS were significantly associated with male (OR, 1.304; 95% CI, 1.111 - 1.532), usually/always snoring (OR, 3.452; 95% CI, 2.800 - 4.257), usually/always witnessed sleep apnea (OR, 5.494; 95% CI, 4.143 - 7.286), weekday sleep duration (OR, 0.850; 95% CI, 0.797 - 0.90), weekend sleep duration (OR, 1.041; 95% CI, 1.004 - 1.080), CUW sleep duration (OR, 1.063; 95% CI, 1.026 - 1.101), perceived insufficient sleep (OR, 1.299; 95% CI, 1.092 - 1.545), increased internet addiction (OR, 1.031; 95% CI, 1.024 - 1.038), often coffee consumption (OR, 1.857; 95% CI, 1.443 - 2.390), often alcohol consumption (OR, 2.377; 95% CI, 1.292 - 4.374), sleeping with a doll or pets (OR, 1.60; 95% CI, 1.351 - 1.895), and keeping TV or radio during sleep (OR, 1.325; 95% CI, 1.084 - 1.619).
Conclusion: Short weekday sleep duration and CUW sleep duration are associated with abnormal behavior during sleep in Korean adolescents.
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0704

COMPARATIVE EFFICACY OF TONIC MOTOR ACTIVATION FOR MEDICATION-NAÏVE AND DOPAMINERGIC-TREATED RESTLESS LEGS SYNDROME

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Introduction: Due to augmentation, exposure to dopaminergic treatment induces worsening of restless legs syndrome (RLS) and reduces response to gabapentinoid medications, frequently leading to refractory RLS. Tonic motor activation (TOMAC) is a noninvasive neurostimulation therapy indicated for refractory RLS. We tested if response to TOMAC is affected by dopaminergic treatment.
Methods: We retrospectively analyzed two clinical trials that each enrolled a mixture of adults with primary moderate-severe RLS who were medication-naïve (drug-naïve), treated with dopamine agonist medication (DA-treated), or other medication history (not analyzed here). There was no drug washout. Trial 1 (NCT04700683, mean age 55.6, 56% female) employed crossover design with 2-weeks of TOMAC and sham control in randomized order. Trial 2 (NCT05214963, mean age 56.0, 69% female) employed parallel design with participants randomized to 2-weeks of TOMAC or sham. Participants were instructed to self-administer 30-minutes of treatment when they experienced RLS symptoms. RLS severity was assessed based on change to mean International RLS Scale (IRLS) score. P-values were determined with two-factor ANOVA for treatment assignment and medication history.
Results: RLS severity improved similarly for drug-naïve and DA-treated RLS patients during TOMAC relative to sham treatment. In Trial 1, mean IRLS change during TOMAC was -4.2 points for drug-naïve (sham: 0.0 points; n=13) and -4.5 points for DA-treated (sham: -1.4; n=14) groups; treatment assignment main effect was significant (p=0.011) and there was no interaction between medication history and treatment assignment effects (p=0.679). In Trial 2, mean IRLS change during TOMAC was -6.3 points for drug-naïve (sham: -1.4; n=25) and -8.6 points for DA-treated (sham: -4.9; n=14); treatment assignment main effect was significant (p=0.010) and there was no interaction between medication history and treatment assignment effects (p=0.701). For all groups, IRLS change was >3 points different for TOMAC compared to sham, the minimal clinically significant difference.
Conclusion: There was no difference in TOMAC efficacy between DA-treated and medication-naïve RLS. TOMAC treatment consistently resulted in greater RLS improvement than sham control. This differs from gabapentinoids, which have reduced effectiveness following DA treatment. These results may indicate an advantage of TOMAC over gabapentinoids for refractory RLS.
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0705

DETECTION OF PERIODIC LIMB MOVEMENTS DURING SLEEP IN RLS USING TONIC MOTOR ACTIVATION SYSTEM AND MACHINE LEARNING

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Introduction: Periodic limb movements during sleep (PLMS) are the most important objective correlate of restless legs syndrome (RLS) and, thus, could be beneficial for long-term monitoring and management. We aimed to develop a machine learning (ML) model to detect PLMS based on inertial measurement unit (IMU) movement sensors within an existing therapeutic device for refractory RLS – the tonic motor activation (TOMAC) system.
Methods: Twenty-two individuals with RLS completed a total of 32 nights of polysomnography (PSG) while wearing bilateral TOMAC units externally on the lower legs at the head of the fibula. Each TOMAC unit continuously recorded accelerometer and gyroscope data from a 6-axis IMU. Features including signal statistics, frequency domain characteristics, and positions were extracted from each IMU sensor in 2-second epochs throughout the night. Features were aggregated into 60-minute windows, input into a random forest ML model, and evaluated using leave-one-out cross-validation. Ground truth PLMS assessment was based on tibialis anterior EMG collected as part of PSG and technician-scored without excluding movements related to respiratory events. Classification metrics, Pearson correlations, and Bland-Altman plots were used to evaluate agreement, variability, and bias between ML model predictions and ground truth, based on ability to estimate periodic limb movement index (PLMI) for each hour and ability to screen for pathological PLMS based on the diagnostic cutoff PLMI >15/hour.
Results: For calculating PLMI for each hour (n= 215 hours), ML model predictions were highly correlated with ground truth (r= 0.890) and showed minimal bias (mean ± SD= 0.11 ± 21.05). For classifying potential presence/absence of pathological PLMS, ML model predictions had high accuracy (0.907), specificity (0.958), and area under the curve (AUC, 0.841).
Conclusion: The TOMAC IMU feature-based ML model showed strong agreement with PSG-based ground truth for calculating PLMI and screening for pathological PLMS. This suggests that the therapeutic TOMAC system might also offer the possibility for long-term, in-home PLMS monitoring.
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0706

DEXTROMETHORPHAN FOR RESTLESS LEGS SYNDROME: TESTING THE GLUTAMATE THEORY

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Introduction: Restless legs syndrome (RLS) is a common disorder of unpleasant sensations during inactivity, an urge to move the legs, and hyperarousal. The pathophysiology is incompletely understood. Treatments are not always successful or carry side effects.
Methods: (Case Report)
Results: A 45-year-old woman presented with over a decade of RLS and sleep-onset insomnia. The diagnosis was based on the International RLS Study Group criteria. The severity was assessed by the nightly occurrence and Insomnia Severity Index (ISI) of 25. Interfering neurologic or sleep disorders, medications, and abnormal blood work were ruled out. Different dopamine agonists resulted in augmentation. Caffeine was stopped. Polysomnography revealed periodic limb movement with sleep fragmentation. Gabapentin was partially effective and poorly tolerated at high doses, but continued at 600 mg. While using Dextromethorphan (DXM) for an upper respiratory infection, the patient found dramatic improvement of her RLS symptoms. Independently, she discontinued Gabapentin, and continued DXM 30 mg for 6 months, with consistent improvement. ISI decreased to 10. Ultimately, considering its expense, DXM was tapered, and Tramadol initiated. The pathophysiology of RLS is partially understood. Studies showed abnormalities in iron regulation, low adenosine tone, enhanced glutamatergic activity, inflammation, and a genetic predisposition, as contributing factors. Alpha-2-delta calcium channel ligands inhibit the presynaptic glutamate release. Central nervous system iron deficiency may increase glutamatergic tone. Ketamine, an N-methyl-D-aspartate (NMDA) receptor antagonist, inhibits the activation of NMDA receptor by glutamate and decreases glutamate presynaptic release. Ketamine was reported to effectively treat RLS. DXM, another NMDA receptor antagonist, has not been reported to treat RLS in the literature. Additionally, an association between inflammation and RLS was described, and limited data showed anti-inflammatory effect of DXM.
Conclusion: Patients with RLS suffer from their symptoms' burden. Approved medications could carry side effects, or augmentation. We report a case of severe RLS with dramatic and sustained improvement with DXM.
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0707

ERECTILE DYSFUNCTION IN RESTLESS LEGS SYNDROME

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Introduction: Restless Legs Syndrome (RLS) is a sleep disorder characterized by uncomfortable dysesthesia and the urge to move the legs, particularly during sleep. Erectile dysfunction (ED) is a condition of inability to get or maintain sufficient firmness to have satisfactory sexual intercourse. This study aims to investigate the ED using the International Index of Erectile Function (IIEF) in RLS patients.
Methods: This is a prospective study at a university hospital in South Korea. From May 2021 to August 2023, all male subjects who underwent overnight polysomnography were asked to complete a series of sleep questionnaires including Insomnia severity index (ISI), Beck's depression inventory (BDI), Beck's anxiety inventory (BAI), Epworth sleepiness scale (ESS), Pittsburgh Sleep Quality Index (PSQI), Short-form 36 (SF-36), and IIEF.
Results: A total of 74 and 107 subjects of RLS and controls were included in this study, respectively. Excluding 29 who haven't had sex in the past month, 58 RLS and 94 controls were analyzed. There was no difference in mean age between RLS (52.38±14.39) and controls (53.21±15.07) (p=0.767). The total score of IIEF was 15.31±5.73 in RLS and 17.77±6.26 in control (p=0.010). RLS had lower body mass index than controls (25.39±3.41 vs. 27.54±4.23, p=0.010); however, no difference in BDI (14.22±7.71 vs.13.80±11.96, p=0.391), BAI (10.90±8.29 vs. 9.50±12.53, p=0.267), and apnea-hypopnea index (16.39±24.95 vs. 13.63±16.01, p=0.523). RLS had a higher score in insomnia (ISI: 15.62±6.79 vs. 5.70±5.04, p< 0.001), more daytime somnolence (ESS: 7.97±4.33 vs. 4.58±2.71, p< 0.001), lower quality of

sleep (PSQI: 12.59±4.22 vs. 6.81±3.53, p< 0.001). RLS showed lower mental health (SF-36 mental health: 62.91±17.75 vs. 73.75±11.05, p=0.014), although there was no difference in SF-36 total score.
Conclusion: This is the first study that evaluated ED in patients with RLS. The subjects with RLS showed poorer sleep quality and lower IIEF scores than the controls. This study suggests an association between RLS and erectile dysfunction.
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0708

EXPLORATORY COST-EFFECTIVENESS ANALYSIS OF TOMAC FOR MEDICATION-REFRACTORY RLS, BASED ON LONGER-TERM CLINICAL DATA

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Introduction: Tonic motor activation (TOMAC) is a non-invasive neuromodulation therapy that provides a non-pharmacologic treatment alternative for patients suffering from medication-refractory restless legs syndrome (RLS). In the current analysis, recently reported longer-term clinical data were used to update prior exploratory cost-effectiveness work.
Methods: A previously published decision-analytic Markov model was utilized to project outcomes over a lifetime horizon. The cohort and treatment effects modeled were sourced from the extension cohort of the RESTFUL study (mean age 57.6, 43.8% male). Health-related quality of life (EQ-5D utilities) and symptom severity were derived from International RLS Study Group (IRLS) scores reported at baseline and 32-weeks after RESTFUL study entry and compared between the TOMAC (continued TOMAC for 24-weeks following RESTFUL study completion) and control arms. The primary outcome measure was the incremental cost-effectiveness ratio (ICER), measured as the difference in quality-adjusted life years (QALY) gained divided by difference in costs, with costs and resource utilization derived from fee schedules and published data. Cost-effectiveness was evaluated against thresholds of $50,000/$150,000 per QALY, and extensive scenario analyses were performed.
Results: Study-observed IRLS scores were reduced by -11.3 from baseline to 32 weeks for TOMAC and -5.4 for control. The resulting treatment effect of -5.9 corresponded to a change in utility from 0.82 to 0.87 (0.77 to 0.87 vs. baseline). Over lifetime, TOMAC added 0.73 and 1.44 QALYs (12.98 vs. 12.25 and 12.91 vs.11.47) at incremental costs of $28,066 and $19,072 ($211,704 vs. $183,638 and $212,644 vs. $193,572), resulting in ICERs of $38,685 and $13,251 per QALY gained vs. control and baseline, respectively. TOMAC was found cost-effective or dominant across all tested scenarios, with ICERs ranging from -$29,558 to $48,266 and -$40,684 to $19,564, vs. control and baseline, respectively.
Conclusion: This updated analysis based on longer-term data confirms earlier findings and suggests TOMAC therapy can provide a high value treatment alternative for patients suffering from medication-refractory RLS. Further increased effect sizes in the longer-term data support assumptions about maintained effect size over time.
Support (if any): Wing Tech Inc. received consulting fees from Noctrix Health. AR is an investigator in the RESTFUL study.

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0709

INCIDENCE, DETERMINANTS, AND IMPACT OF RLS DURING PREGNANCY AND PUERPERIUM

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Introduction: RLS is associated with a lower quality of life. During pregnancy, RLS is highly frequent and peaks in the third trimester. The main objective of the present study was to evaluate the impact of RLS on sleep during pregnancy and puerperium by using subjective and objective data.
Methods: This study was part of the multicenter study "Life-ON", prospective, cohort investigation on sleep and mood changes during early pregnancy until 12 months after delivery. The presence of Restless legs Syndrome (RLS) was assessed in interview, according to essential criteria for diagnosis of RLS proposed by the International RLS Study Group (IRLSSG) during 11 visits (1 º, 2 º and 3 º trimester; and after delivery – 8 visits). Sleep was evaluated by PSG during the 2º trimester. Mood (MADRS, EPDS, HDRS-21), sleep quality (PSQI), insomnia (ISI), sleepiness (ESS) were also assessed at visits.
Results: Out of the 439 pregnant women recruited, 113 (26.037%) met the criteria for diagnosis of RLS. Together with the prevalence, the severity of RLS get worse in the third trimester. Pregnant women suffering from RLS had a worse sleep quality and insomnia then non-RLS women. A reduction in Sleep Efficiency and an increase in PLMS have also been demonstrated by polysomnography. Mood deflection was also associated with RLS; while RLS was not associated with adverse fetal outcomes and pregnancy related complications.
Conclusion: RLS is confirmed to be highly prevalent in late pregnancy. A negative impact of RLS on mood and sleep was evident from both subjective and objective tests.
Support (if any):

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0710

REM BEHAVIOR DISORDER EXPLAINABILITY IN EEG VIA SPECTRAL BAND CLUSTER PREVALENCE

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Introduction: Prior work has established substantial overlap in polysomnography features between synucleinopathy-associated RBD and PTSD/TASD-associated RBD (trauma-associated-sleep-disorders). However, our mechanistic understanding remains limited. To explore RBD endophenotypes, we applied a novel analysis for clustering and categorizing PSG without AI/ML or sleep scoring, Spectral-Band Cluster-Prevalence (SBCP),

to examine and compare differences in EEG characteristics between patients with RBD diagnosis versus clinical controls.
Methods: Our data source was retrospective EEG/EOG recordings from N=124 PSG participants (age=57.5 [SD=15]) including n=74 RBD diagnosed patients (defined by PSG findiings and patient-reported dream-enactment) with n=50 clinical controls (AHI< 15). EEG-channels were excluded based on artifacts, normalized to max voltage, EOG-channels were normalized to in-channel voltage, and extracted into ten-second segments. Signal features were extracted for each segment: EEG delta(1-4Hz), theta(4-8Hz), alpha(8-12Hz), beta(12-30Hz) spectral band-powers and EOG broadband-powers. Feature EEG band-powers were projected into 3-dimensional subspace, where optimal parameters for Gaussian Mixture Model (GMM) were identified to allow for mixed EEG states. Cluster quality measures Silhouette, Davies-Bouldin, Akaike-Information-Criterion were evaluated to determine the optimal number of components (i.e. unique EEG states) required by the GMM to maximize the explained variance based on global optima in cluster quality values. Dwell-Fraction was estimated by assigning components to ten-second EEG segments, and used to report between-groups differences.
Results: GMM global optima identified n=3 components as the optimal number to describe short segments of EEG/EOG measured by how well the components explain RBD-associated between-group differences, showing the highest cluster quality values observed across all 3 cluster quality measures. Dwell-Fraction (defined as: percentage of total-sleep-time spent in each component), revealed statistically significant differences associated with RBD (Component-3: RBD>Controls) and clinical controls (Component-1: Controls>RBD) based on Mann-Whitney-U and t-test results. ROC-AUCs were calculated for classifying RBD-vs-Controls, based only on the Dwell-Fraction (Component-3: 0.65, Component-1: 0.57, Component-2: 0.52). Relative to Component-1, which best described controls, Component-2 best described RBD. Further, Component-2 showed band-power distributions associated with RBD including significantly higher theta/alpha band-power in EOG-channels, lower delta/beta band-power in EEG frontal-channels, and higher delta band-power in EEG central-channels.
Conclusion: Spectral-Band Cluster-Prevalence has potential applications to improve identification of RBD and RBD subtype-specific EEG biomarkers associated with synucleinopathy and PTSD/TASD.
Support (if any):

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0711

REM SLEEP BEHAVIOR DISORDER DIAGNOSTIC CODE ACCURACY AND IMPLICATIONS IN THE OUTPATIENT SETTING

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Introduction: Isolated REM sleep behavior disorder (iRBD) carries increased risk for neurodegenerative parkinsonian disorders or dementia (NPD), but is difficult to accurately screen for in the community. Healthcare data offer the opportunity to identify large numbers of iRBD cases among outpatients. We aimed to determine the positive predictive value (PPV) of an RBD international classification of disorders (ICD) code for actual iRBD based on manual review of the electronic health record (EHR), examine risk of NPD diagnosis, and explore whether a statistical model developed using selected EHR data can identify individuals with RBD ICD code that have high probability for actual iRBD.
Methods: In this retrospective cohort study, an EHR search at a single healthcare system was conducted to identify outpatient cases who received ICD9 or ICD10 RBD code in 2011-2021. The EHR for each case was manually reviewed. Cases with secondary causes of RBD were excluded. Remaining cases were classified as no iRBD or actual iRBD. Incident cases of NPD were identified. PPV of presence of RBD ICD code for actual iRBD was calculated. Cumulative incidence of NPD with death as a competing event was compared in those with vs without iRBD. Least absolute shrinkage and selection operator (LASSO) regression was used to build a prediction model for iRBD and the model was validated in an independent dataset.
Results: Among 1,130 cases with RBD ICD code, 499 had secondary causes of RBD. For the remaining 628 cases, determination based on EHR review was that 168 (26.8%) did not have iRBD; PPV of RBD ICD code was 73.25%. Compared to the no iRBD group, the iRBD group had a higher risk of NPD (sub-distribution hazard ratio=10.4 (95% CI 2.5-43.1)). The LASSO prediction model for iRBD had an Area Under the Receiver Operating Characteristic Curve of 0.844 (95%CI 0.806-0.880).
Conclusion: PPV of an RBD ICD code is moderate. In the real-world setting, patients with iRBD had a high risk of diagnosis of NPD. Results indicate feasibility of using statistical models developed using EHR data to accurately predict iRBD.
Support (if any): This work was partially funded by the University of Pittsburgh Dean's Faculty Advancement Award (Chahine PI).

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0712

TONIC MOTOR ACTIVATION FOR RESTLESS LEGS SYNDROME IS COMPATIBLE WITH SLEEP ONSET AND REDUCES PERIODIC LEG MOVEMENTS

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Introduction: Tonic motor activation (TOMAC) is a noninvasive neurostimulation therapy indicated for refractory restless legs syndrome (RLS). Here, we characterized the acute response to TOMAC based on objective evidence from polysomnography (PSG).
Methods: Adults with primary moderate-severe refractory RLS (n=23) were enrolled in a clinical trial (NCT05214963) that included a night of PSG with TOMAC treatment. Participants were instructed to activate TOMAC sessions to address RLS symptoms before sleep onset (bedtime session, n=8) and/or awakenings during the sleep period (mid-sleep session, n=19). When activated, TOMAC bilaterally stimulated the peroneal nerve for 30-minutes and turned off automatically. For each 30-minute TOMAC session, periodic leg movements during sleep (PLMS) were compared between the last 15min of sleep before TOMAC activation and the first 15min of sleep after TOMAC activation.
Results: Sleep initiation occurred during 75% of bedtime TOMAC sessions and 84% of mid-sleep TOMAC sessions.

Mean duration from TOMAC activation to sleep was 21.9 min for bedtime sessions (median 16.1, SD 15.7) and 13.6 minutes for mid-sleep sessions (median 7.4, SD 15.4). Mean TOMAC intensity at the time of sleep onset/re-initiation was 27.2mA (SD: 5.8), similar to previous clinical trials. For mid-sleep TOMAC sessions, mean PLMS frequency reduced by 75% from 36.7/hour (SD: 68.6) before TOMAC activation to 9.1/hour (SD: 37.5, p< 0.01) after TOMAC activation; this corresponded to 68% reduction relative to mean PLMS frequency during the full sleep period (28.6/hour).

Conclusion: TOMAC was compatible with sleep; both sleep onset and re-initiation were prevalent during TOMAC administration at therapeutic stimulation intensities. TOMAC was also associated with significant acute reduction in PLMS. These results motivate investigation of the longer-term effects of TOMAC on sleep architecture and PLMS.

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0713

VARIABILITY OF SOFTWARE SCORED PLM'S

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Introduction: Periodic leg movements have been a source of debate as to their clinical significance. Interpretation varies between no clinical significance (Mahowald MW 2001) to a relationship to Heart disease (Skomo R 2009). Routine technician scoring of PLM's is rare outside of academic institutions. Insurances, including Medicare and Medicaid, will not approve a repeat study only for evaluation of PLM's. The following brief study was initiated to review automated software scoring of periodic leg movements based on one sleep study per a patient (Respironics Alice G3).

Methods: Data was obtained from 56 sequential sleep studies with ~240 min of sleep (225 – 434, median 330). "PSG" represents all studies without titration. There were more females (17) than males (8), Ages (24 – 70, median 49.5). This data set is small and not a normal distribution. A technician scored minutes of sleep and AHI, (.4-96.7, median 5.4) while PLM's were autoscored (G3).

Results: There was significant variability in the software generated PLMI, Range 765 (4 –769) median 75.5. • There wasn't a useful correlation between AGE and PLMI (r2 = .019); thus, of little predictive value in an individual patient's single test. • The PLMI was not predicted nor differentiated by gender. • There wasn't a useful correlation between PLMI being related to AHI (r2 = .006), also of little predictive value in an individual patient's single test.

Conclusion: Most clinicians can rely only on one sleep study, one measure, of PLMI. This brief study suggests that PLM's scored by software varies greatly when obtained from a single study. Software scored PLMI results must be used with caution in making diagnoses such as PLMD or criteria for RLS. A clinician might have to reject the reported PLMI result.

Support (if any):

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0714

WEIGHT LOSS IN PATIENTS PRESCRIBED METHADONE FOR RESTLESS LEGS SYNDROME

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Introduction: Weight loss is an underexplored side effect of methadone. While methadone is associated with weight gain when used to treat opioid use disorder, its impact on patients with restless legs syndrome (RLS) remains unclear. This study aims to assess the prevalence of significant weight loss in RLS patients prescribed methadone.

Methods: 73 consecutive patients for whom at least 6 months of follow-up was available following initiation of methadone for RLS and who were not undergoing weight loss interventions were assessed. Clinical information was extracted from the initial visit and all subsequent visits conducted throughout the course of methadone treatment (mean duration=2.9 years). Examination of associations with weight loss >10% and >20% of body weight within the first 6 months of methadone initiation was performed.

Results: In the 73 patients, the mean age was 67.6, mean BMI=29.3 and 51.4% were female. At methadone initiation, 18.1% were taking dopamine agonists (DA), 30.6% alpha-2-delta calcium channel ligands (A2D), and 38.9% both DAs and A2Ds. Notably, 19.4% of patients experienced weight loss >10%, and 6.9% lost >20% of their body weight. Those who lost >10% had higher rates of reducing or discontinuing DAs (71.4% vs 49.2%) and higher average BMI (31.9 vs 28.6) than those who did not, but had similar prevalence of reducing or discontinuing A2Ds (35.7% vs 42.4%). Other factors, such as 6-month methadone dose, use of antidepressants, diagnoses of obstructive sleep apnea, and prior opioid use were balanced between the two groups. 80% of those with >20% weight loss (vs 11.8% with < 20% weight loss) had nighttime eating diagnoses. Patients with substantial weight loss described a dramatic reduction in appetite with loss of interest and pleasure from normally desirable foods.

Conclusion: This study reveals significant weight loss in a subset of RLS patients prescribed methadone. Changes in A2Ds, an RLS medication known to increase weight, were not different in those with weight loss. Other opioid-related side effects, such as nausea or constipation, could impact appetite and also contribute to weight loss. Clinicians should monitor patient weight during methadone treatment to prevent potential health risks.

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0715

NREMEMBRANCE OF THINGS PAST: OBSTRUCTIVE SLEEP APNEA IMPACTS SLEEP NEUROPHYSIOLOGY AND MEMORY RETENTION IN AGING

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Introduction: Obstructive sleep apnea (OSA) is associated with sleep disturbances, memory impairment, and dementia risk in older adults. The impact of OSA on sleep neurophysiology and related memory function remains unclear. We examined associations among OSA severity, non-rapid eye movement (NREM) sleep expression, and overnight memory retention in cognitively intact older adults at risk for Alzheimer's disease (AD).

Methods: Overnight clinical polysomnography (PSG) with 256-channel electroencephalography (EEG) was conducted in 81 cognitively intact older adults (aged 61.68□5.99 years, 49 female, Apnea/hypopnea Index, AHI: 7.61□10.64), with word-pairs task (WPT) encoding and cued recall occurring prior to and following sleep. AHI, respiratory disturbance index (RDI), and oxygen desaturation index (ODI) were used as measures of OSA severity and cube-root transformed to normality. EEG data underwent preprocessing, artifact rejection, and segmentation into concatenated NREM epochs, and were then processed using multitaper spectral analysis with 11 tapers. Behavioral data, obtained as overnight proportion change in retention of word-pairs, were also cube-root transformed to enhance normality. Topographical correlations were then computed to examine associations between NREM sleep features and OSA severity, using 5000 permutations of threshold-free cluster enhancement (TFCE) for multiple comparisons correction. Multiple linear regression modeling was leveraged to examine whether spatio-spectral NREM clusters associated with OSA severity were in turn predictive of overnight memory retention when adjusting for age and sex.

Results: Global, TFCE-significant ($p < 0.05$ corrected) negative correlations were seen between delta power (1-4.5Hz) and AHI and RDI, theta power (4.5-7.5Hz) and AHI and RDI, alpha power (7.5-11Hz) and RDI, and slow sigma power (11-13Hz) and ODI . Regression models (adjusted for age and sex) using cluster averages of spectral power from prior correlations to predict WPT performance further revealed significant effects for theta power (AHI cluster: B=0.077, p=0.007; RDI cluster: B=0.076, p=0.008), alpha power (RDI cluster: B=0.107, p=0.010), and for slow sigma power (ODI cluster: B=0.203, p=0.007), but not for delta power (both clusters: $p>0.33$).

Conclusion: These findings indicate that OSA is associated with globally disrupted NREM sleep expression, and that reduced theta, alpha, and spindle activity is further associated with impaired overnight episodic memory retention.

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0716

LONGITUDINAL ASSOCIATIONS OF WEEKEND CATCH-UP SLEEP AND SLEEP ABILITY WITH MORTALITY IN MIDDLE-AGED ADULTS

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Introduction: The question remains as to whether and in which individuals weekend catch-up sleep (CUS) promotes health. The health effects of weekend CUS could differ depending on both the ability to obtain sufficient sleep during weekdays and the amount of weekend CUS required to compensate for sleep lost during the week. We examined the longitudinal association of these two aspects of sleep with all-cause mortality.

Methods: We used data from 3,128 middle-aged (40–64 years) participants of the Sleep Heart Health Study. We defined one's weekend CUS as no, short (1 h), and long (2 h or more) according to self-reported sleep durations on weekdays and weekends. Polysomnography-measured total sleep time, representing the ability to obtain sufficient sleep, was classified into short (< 360 min) or normal (≥ 360 min) sleep durations. We estimated multivariable-adjusted mortality hazard ratios (HRs) and 95% confidence intervals (CIs) for six groups divided by the extent of CUS and sleep duration.

Results: A total of 232 deaths (7.4%) were reported over a median (interquartile range) follow-up time of 12.3 (11.3–13.5) years. Short weekend CUS with normal sleep duration (≥ 360 min) was associated with lower mortality compared to no CUS with normal sleep duration after adjustment for established risk factors for survival including self-reported habitual sleep duration and social jetlag (adjusted HR, 0.48; 95% CI 0.27–0.83). When stricter cutoffs were applied for short and normal sleep durations, while the protective effect of short CUS with normal sleep duration (≥ 390 min) was strengthened (adjusted HR, 0.36; 95% CI 0.17–0.78), the harmful effect of short CUS with short sleep duration (< 330 min) emerged (adjusted HR, 1.84; 95% CI 1.08–3.14).

Conclusion: Our results emphasize the importance of balancing between the extent of weekend CUS required to compensate for sleep debt that accumulates during weekdays and one's ability to obtain sufficient sleep that could minimize the accumulation of nightly sleep loss among middle-aged adults. Weekend CUS may substantially benefit individuals who maintain their sleep ability and thus require a small amount of CUS.

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0717

AGEISM AND INSOMNIA: EXAMINING THE RELATIONSHIP BETWEEN NEGATIVE AGING STEREOTYPES AND INSOMNIA IN OLDER ADULTS

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Introduction: Although insomnia symptoms (e.g., sleep disturbances, daytime complaints) are more prevalent in older age, poor sleep is not guaranteed in older adulthood. Preliminary research has found a relationship between an individual's greater awareness of age-related changes and poor sleep; however, more research is needed to observe this relationship in insomnia and aging stereotypes. Using data from a nationally representative sample of U.S. veterans, the present study sought to characterize the relationship between negative aging stereotypes and clinical insomnia symptoms.
Methods: Participants (N=3,000) were older veterans (aged 60-99) who participated in the National Health and Resilience in Veterans Study (NHRVS). Participants reported their insomnia severity (Insomnia Severity Index [ISI]), sleep disturbance (ISI Factor 1 [items1,2,3]), and daytime dysfunction (ISI Factor 2 [items4,5,6,7]). Negative aging stereotypes were assessed using a 3-item Expectations Regarding Aging scale, which assessed negative stereotypes related to emotional, physical, and cognitive aging. Sociodemographic characteristics, mental health and medical conditions, traumatic life events, physical activity, disability, and psychotropic medication use were also assessed.
Results: Veterans who screened positive for clinical insomnia (n=213; weighted 7.1%) scored significantly higher on measures of negative stereotypes regarding emotional (p<.001), physical (p=.003), and cognitive (p=.013) aging. Multivariable regression analyses revealed that, after adjusting for a broad range of sociodemographic, trauma, and health covariates, greater endorsement of negative stereotypes regarding emotional aging was associated with significantly greater odds of screening positive for clinical insomnia (OR=1.57, 95%CI=1.24-1.99, p<.001), as well as higher rates of sleep disturbance (OR=1.54, 95%CI=1.28-1.86, p<.001) and daytime dysfunction (OR=1.67, 95%CI=1.40-2.00, p<.001). Relative to veterans who fully rejected aging stereotypes, those who somewhat and fully endorsed them were 3- and 6-times more likely to screen positive for clinical insomnia, respectively (predicted probabilities=0.10 and 0.18 vs. 0.03).
Conclusion: Negative aging stereotypes, especially emotional aging, were related to clinical insomnia symptoms in a nationally representative sample of U.S. veterans aged 60+. These findings suggest that efforts to modify aging stereotypes in older veterans may help improve overall sleep quality, or alternatively, that addressing clinical insomnia may help mitigate negative aging stereotypes. Longitudinal studies are needed to evaluate interrelationships between these measures over time.
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0718

LATENT CLASSES OF SLEEP PROBLEMS AND SUBJECTIVE COGNITIVE DECLINE AMONG U.S. MIDDLE-AGED AND OLDER ADULTS

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Introduction: Subjective Cognitive Decline (SCD) can be an early sign of Alzheimer's disease. Previous studies have linked sleep problems to a higher risk of SCD using a variable-centered approach (e.g., adding sleep symptoms to form a score); however, sleep problems may cluster differently among people. Thus, we employed a person-centered approach to understand sleep problems and their association with SCD. We aimed to: 1) identify latent classes (profiles) of self-reported sleep problems among U.S. middle-aged and older adults; 2) investigate the cross-sectional association between the classes and SCD; and 3) investigate whether this association differs by age group.
Methods: For Aim 1, we studied 33,922 adults aged 45+ years from the 2017 U.S. Behavioral Risk Factor Surveillance System (BRFSS) with data on sleep problems, including short or long sleep duration, trouble falling or staying asleep, unintentionally falling asleep, snoring loudly, and observed breathing stopped. Latent class analysis classified participants based on their responses to sleep problems. For Aim 2, we studied a subsample from Oregon, the only state that administered both sleep and SCD modules (n=2,747). SCD was assessed by an item regarding worsened confusion or memory loss in the past 12 months. Logistic regression examined the association between class membership and SCD, adjusting for demographics, socioeconomics, health behaviors, and chronic conditions. For Aim 3, we added a class membership × age group (45-65 years; >65 years) interaction term to the model.
Results: Among all participants, 51.5% were aged 45-65 years, 56.7% were females, and 85.1% were White. We identified and labeled four classes: "Combined Insomnia and Apnea" (8.6%); "Primarily Insomnia " (17.6%); "Primarily Apnea " (25.8%); and "Healthy" (48.0%). In adjusted models, compared to the Healthy class, participants in the Combined Insomnia and Apnea class had higher odds of SCD (OR=1.91, 95% CI =1.15-3.15). There was no significant age × class membership interaction.
Conclusion: U.S. adults aged 45+ years in the "Combined Insomnia and Apnea" latent class of sleep problems showed a higher risk for cognitive decline, compared to the "Healthy" class. The finding may help to facilitate more targeted and tailored sleep interventions to prevent cognitive decline in middle-aged and older adults.
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0719

HOW WEEKLY SLEEP FLUCTUATIONS AFFECT PAIN PERCEPTION: AN EXPERIMENTAL STUDY IN HEALTHY FEMALES

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Introduction: Acute experimental sleep deprivation is known to induce pain hypersensitivity, with a more pronounced impact on females than males. Sleep restriction or fragmented sleep result in distinct pain hypersensitivity profiles. However, the influence of weekly sleep fluctuations, particularly between working days and weekends, on pain perception remains unclear. This experimental study investigates how weekly sleep variations affect pain perception in healthy women recruited from a university community.
Methods: A DREEM headband was used to monitor sleep, and pain sensitivity was measured using quantitative sensory testing, including heat, cold, and pressure thresholds, as well as temporal summation and conditioned pain modulation on both Monday and Friday.
Results: 26 healthy females with an average age of 25.53 (CI: 22.95 to 28.11) participated. A distinct sleep pattern was observed, with a shorter sleep onset latency (t = -1.58, df = 25, p = .033), a higher number of awakenings (t = 1.98, df = 24, p = .03), and a higher N1 sleep percentage (t = 1.72, df = 25, p = .049) on Sunday night compared to Thursday night. Sleep patterns throughout the week indicated a one-hour shift later in bedtime (F=2.45, p =.06, Observed power=.69) and wake-up time (F=4.48, p=.007, Observed power= .92), more awakenings (X2 (2) = 12.17, p = 0.05), and less N3 sleep duration (F=3.29, p = .022, Observed power=.82) over weekends than weekdays, highlighting more fragmented sleep during weekends. Paired-sample t-tests revealed pain hypersensitivity with increased heat pain summation (t= 3.353, CI: .57 to 2.39, p = .003) and a trend toward decreased pain inhibition (t=-.56, CI: -45.28 to 26.28, p>.05) on Monday compared to Friday. No changes in pain thresholds were observed.
Conclusion: Although the sleep changes were somewhat unexpected, with poorer sleep observed over the weekend, the study underscores the potential role of weekly sleep fluctuations in modulating pain sensitivity,
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0720

A CONE BEAM CT STUDY OF UPPER AIRWAY MORPHOLOGY IN PERIMENOPAUSAL AND POSTMENOPAUSAL WOMEN

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Introduction: Menopause is accompanied by a decline in estrogen and progesterone. Several studies have demonstrated that upper airway patency decreases in women after menopause, while morphology changes are still a lack of evidence. This study aimed to explore upper airway morphology changes in perimenopausal and postmenopausal women.
Methods: This retrospective cross-sectional study included 367 consecutive Chinese female patients over 25 years old who had routinely taken large-field cone beam computed tomography in the imaging library of Peking University School and Hospital of Stomatology from October 2016 to September 2020. A total of 283 males were screened as sex controls according to the same age group. Upper airway morphology, hyoid position and facial pattern were measured. The association between perimenopausal and postmenopausal years and upper airway morphology in both sexes was analyzed.
Results: Perimenopausal women (aged 45–54 years) showed a significant decrease in the volume (3172.91mm3, 95% CI = 653.86–5691.96) and minimum cross-sectional area (37.08 mm2, 95% CI = 5.36–68.80), and a significant increase in the length (−1.96mm, 95% CI = −3.62 to −0.29) of upper airway compared to adjacent reproductive years (aged 35–44), while this difference was neither seen in other adjacent two reproductive age groups of females nor in the same age groups of males. In postmenopausal women (55 years and older), hyoid position was significantly lower (−2.74mm, 95% CI = −4.42 to −1.07) than either age group, while no similar changes were seen in men.
Conclusion: Women had smaller airway volume, reduced upper airway cross-sectional area and longer airway length in perimenopausal years, and a significantly lower hyoid position in postmenopausal years. These changes may be related to menopause itself and independent of the changes associated with aging.
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0721

ASSOCIATION BETWEEN SUBJECTIVE-OBJECTIVE SLEEP TIME DISCREPANCY AND MORTALITY IN OLDER MEN WITH/WITHOUT INSOMNIA

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Introduction: Subjective sleep duration often differs from objective measurements. Our prior research indicates that overestimating sleep duration may be a risk factor for all-cause mortality in older men. Conversely, those with insomnia, which is an another mortality risk factor, typically underestimate their sleep duration. This study investigates how both underestimation and overestimation of sleep duration impact all-cause mortality in community-dwelling older men (aged ≥ 65) comparing with and without insomnia symptoms.
Methods: We conducted a secondary analysis using data from the Osteoporotic Fractures in Men Sleep Study, involving 2,200 participants who underwent in-home polysomnography and completed surveys assessing their subjective sleep duration, without using sleep-affecting medication (such as antidepressants, hypnotics or benzodiazepines). Insomnia was defined by a Pittsburgh Sleep Quality Index (PSQI) score over 5 (N = 816). We examined the relationship between subjective-objective sleep duration discrepancy index (SODI) and mortality using Cox regression. SODI, the ratio of subjective to objective sleep duration, was analyzed categorically, comparing its lowest and highest quartiles to the interquartile range within each group. The study was approved by the Ethics Committee of the National Center of Neurology and Psychiatry.
Results: During follow-up periods (mean: 10.6 years for insomniacs, 11.2 years for non-insomniacs), 504 (61.8%) insomniacs

and 774 (55.9%) non-insomniacs died. In the insomnia group, both the lowest (adjusted Hazard Ratio [HR], 1.31; 95% Confidence Interval [CI], 1.02–1.68) and the highest (adjusted HR, 1.31; 95% CI, 1.03–1.66) SODI quartiles were associated with increased mortality compared to the interquartile range. Conversely, in the non-insomnia group, only the highest SODI quartile showed a significant increase in mortality (adjusted HR, 1.30; 95% CI, 1.07–1.59), with the lowest quartile showing no significant mortality association (adjusted HR, 0.94; 95% CI, 0.78–1.14).
Conclusion: Results demonstrate the significant role of subjective-objective sleep duration discrepancy in long-term health outcomes in both the insomnia and the non-insomnia group. Further physiological studies may elucidate the mechanisms of subjective-objective sleep duration discrepancy on mortality.
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0722
CLINICAL, DEMOGRAPHIC, FUNCTIONAL, AND SYMPTOM CORRELATES OF COMISA IN STABLE HEART FAILURE

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Introduction: Sleep disordered breathing (SDB: obstructive & central sleep apnea) and insomnia are common in heart failure (HF). However, most studies have not addressed the presence of combined SDB and insomnia (COMISA). The purposes of this study were to (1) describe COMISA among adults with stable chronic HF; (2) compare the clinical and demographic characteristics between groups with COMISA, insomnia, SDB, and normal sleep; and (3) examine the risk of COMISA in the presence of normal sleep, insomnia, SDB and other clinical and demographic characteristics.
Methods: Secondary analysis of an observational study of sleep among adults with stable HF. COMISA was defined as an apnea hypopnea index (AHI) > 15 with difficulty initiating or maintaining sleep or waking too early in the morning (Insomnia). We measured self-reported (Pittsburgh Sleep Quality Index) and objective sleep characteristics (polysomnography – PSG), symptoms (depression, sleepiness); used chi-square and ANOVA; and calculated the risks of COMISA for normal sleepers and with insomnia or SDB under different conditions (depression, poor sleep quality, left ventricular ejection fraction, age, race, and sex).
Results: The sample included 170 [(M age = 60.3 ± 16.8 years; n = 60 (35%] female. They had normal sleep (n = 37/22%); insomnia only (n = 48/28%): SDB only (n = 46/27%); and COMISA (n = 39/23%). Those with COMISA were significantly more likely to be obese (32.1%) compared to others [13.6% -29.6%, p = 0.0128]. They had the shortest total sleep time (TST) (mean = 291 ± 109 mins) and poorest sleep efficiency (M = 65.8 ± 20.5%) (p = .05). Women with insomnia were less likely to have COMISA than men (36% vs. 51%), while 74% of adults with SDB who were depressed had COMISA, compared with 41% of those with insomnia.
Conclusion: Risk of COMISA is associated with depression and poor sleep among adults with stable HF and SDB. Future study is needed to better understand the risks of COMISA among adults with chronic HF outcomes and to address the need for intervention that addresses it beyond a focus on only SDB or insomnia.
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0723
MULTIDIMENSIONAL SLEEP AND MENTAL AND PHYSICAL HEALTH AMONG RETIRED WORKERS: A SEX-STRATIFIED ANALYSIS

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Introduction: Although individual sleep characteristics relate to mental and physical health among older adults, such sleep characteristics do not exist in isolation. Multidimensional sleep measures may better capture the comprehensive impact of sleep on health. However, few studies have examined multidimensional sleep health in relation to mental and physical health outcomes among retired older adults. Likewise, few studies have examined sex differences in these relationships. This study examined associations between multidimensional sleep and health outcomes (i.e., depressive symptoms, mental health, physical health, and overall perceived health) among retired older adults in models stratified by sex.
Methods: Older adults (n = 154; Mage = 68.4, 55.2 % assigned female at birth) reported depressive symptoms (CES-D), and perceived mental, physical, and overall health (RAND-12). The measurement of multidimensional sleep health involved utilizing wrist actigraphy to assess sleep efficiency, timing, duration, and regularity, alongside diary measures to evaluate alertness and satisfaction. Each component was dichotomized and summed to create a composite score (0-6); higher values indicated better sleep health. Hierarchical linear regressions were used to examine relationships between multidimensional sleep health and health outcomes. Covariates include race, age, years of education, subjective social status, and shiftwork exposure history.
Results: Compared to men, women had poorer multidimensional sleep health (t(135)=2.38, p=.028). In the full sample, poorer multidimensional sleep was associated with greater depressive symptoms (b = -.70, se = .31, p =.024, r2 = .39) as well as poorer physical (b = 1.03, se = .37, p = .006, r2 = .45), mental (b = 1.37, se = .40, p < .001, r2 = .44), and overall perceived health (b = 1.42, se = .35, p <.001, r2 = .52). Sex-stratified analyses showed that significant findings were exclusively evident in women and not in men.
Conclusion: Multidimensional sleep health influences the physical and mental health among older retired women. Future studies should identify the mechanisms underlying sex differences in multidimensional sleep and the links between multidimensional and health outcomes. Such information could provide valuable insights leading to tailored therapeutics that benefit each sex.
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0724

WAKE INTRUSION INDEX DURING NREM SLEEP IS ASSOCIATED WITH COMORBID INSOMNIA AND SLEEP APNEA EXCLUSIVELY IN MEN

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Introduction: Sex differences in the clinical presentation of obstructive sleep apnea (OSA) comorbid with insomnia (COMISA) exist. Men typically exhibit more severe OSA during NREM sleep, while women are more prone to insomnia. Yet, little is know about the physiological correlates likely explaining these differences. This study evaluated the association between sleep stage-specific wake intrusions, a measure of 3-second perturbations in the odds ratio product (ORP) during sleep, and insomnia, OSA, and COMISA, and assessed whether sex differences in these associations are observed.
Methods: Data from the Sleep Heart Health Study (SHHS1; N=5,771) was accessed via the National Sleep Research Resource. Stage-specific wake intrusions were defined as ORP spikes above 2.0, from within N1, N2, N3, and REM. Wake intrusion index (WII) for each sleep stage was calculated as the number of intrusions divided by total sleep time from each stage. Insomnia was determined based on self-report of insomnia symptoms (>15 times/month) including delayed sleep onset, maintenance difficulty, or early morning awakenings (N=617). Obstructive sleep apnea (OSA) was defined by an apnea-hypopnea index (AHI) of ≥15 (N=1,225), and COMISA was defined as having both OSA and insomnia (N=147). Linear regression was used to assess the relationship between sleep disorders and stage-specific WII, adjusted for age and AHI, separately for men and women.
Results: Among men, adjusted analyses showed that WII during NREM was significantly higher in those with COMISA as compared to those with OSA (β[SE]=73.3[27.3] intrusions/h, p=0.008), with effects likely being driven by higher WII during stage N1 (β[SE]=126.4[39.7] intrusions/h, p=0.008). These associations were not observed among women. No other significant differences were found in WII during N2, N3, or REM sleep.
Conclusion: Our findings show a sleep stage and sex-specific association between wake intrusion and COMISA. We speculate that men with COMISA may experience more unstable N1 stage, when compared to those with only OSA. These findings suggest the need for sex-specific approaches to characterization and treatment of COMISA.
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0725

PHENOTYPING OBSTRUCTIVE SLEEP APNEA IN LATIN AMERICAN WOMEN: THE LATIN AMERICAN SLEEP NETWORK (LATAM SLEEP NET)

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Introduction: Obstructive Sleep Apnea (OSA) is a major cardiovascular risk factor and has worse health outcomes. Novel OSA-driven metrics have been associated with worse outcomes. However, data on women from unrepresentative groups, such as the Hispanic/Latino population outside the USA, is scant. This study aims to quantitatively describe the clinical and novel OSA-driven phenotypes among women from Latin America.
Methods: We performed a prospective, multicenter study including women with suspected OSA from 18 sleep clinics in 8 countries (Argentina, Bolivia, Chile, Colombia, Costa Rica, Mexico, Peru, and Uruguay). We extracted the raw data from the baseline sleep study from October 2022 to December 2023. To determine 1). Sleep Apnea Specific hypoxic burden (SASHB) is defined as the total area under respiratory event-related desaturation curves; 2) Specific Heart Rate Response (ΔHR), defined as the difference between a maximum heart rate during a subject-specific search window and an event-related minimum heart rate; 3) Ventilatory burden, defined as the event-specific area under the ventilation signal, identified by amplitude changes in the nasal pressure signal; and 4) Desaturation sensitivity (i.e., the tendency to desaturate) was defined as a hypoxic burden divided by a ventilatory burden.
Results: A total of 318 women were included 26% non-OSA, 38% mild OSA, and 36% moderate to severe OSA). The average AHI3% was 16.5 ev/hr, SASHB was 43.4%min/hr; VB was 244.3 %eupnea*min/h; ΔHR was 8.2 bpm, and the desaturation sensitivity was 0.16. Among OSA patients, the AHI3% was 21.78 ev/hr; SASHB was 57.8 %min/hr; VB was 338.1 %eupnea*min/h; ΔHR was 8.14 bpm, and the desaturation sensitivity was 0.18. Based on high SASHB (≥ 60%min/hr) or high ΔHR (≥ 10 bpm), 19% and 26% of the sample are at risk of worse cardiovascular outcomes, respectively, and 7.4% of the sample reported both criteria associated with adverse outcomes.
Conclusion: Among OSA women from Latin America, OSA-physiologically driven metrics are reproducible and similar to previous publications. Further studies are needed to fully understand the clinical utility of these metrics in clinical practice. Study register ISRCTN11936746.
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0726

LONGITUDINAL CHANGES IN 24-H SLEEP-WAKE PATTERNS AND ALL-CAUSE MORTALITY IN OLDER WOMEN

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Introduction: Sleep-wake patterns generally worsen with advancing age. However, little is known about changes in sleep and circadian patterns in very old adults, and how these changes may be associated with future mortality risk. We examined the association between changes in 24-hour sleep-wake patterns and risk of all-cause mortality in community-dwelling older women.
Methods: We studied 702 women (mean[SD] age = 82.9[2.7] years) who had nighttime sleep (total sleep time [TST]; sleep efficiency; and wake after sleep onset), napping (duration and frequency) and 24-hour rest-activity rhythm (acrophase, amplitude, mesor, and pseudo-F [regularity]) parameters assessed using 4-night/5-day actigraphy at baseline (2002-04) and again 5 years later (2007-08), after which all-cause mortality information was collected using death certificates. The 5-year changes in all parameters were calculated and included in a hierarchical clustering on principal components analysis to identify patterns of sleep changes. We used Cox proportional hazards models to evaluate the longitudinal associations between patterns of sleep changes and all-cause mortality.
Results: During a mean follow-up time of 2.1 years, 90 (12.8%) women died. We identified three patterns of sleep changes: 159 (22.6%) women with Pattern 1 (increased nighttime and daytime sleep and reduced circadian rhythmicity), 233 (33.2%) with Pattern 2 (decreased nighttime sleep quality and duration and reduced circadian rhythmicity), and 310 (44.2%) with Pattern 3 (stable sleep or slight improvement). After adjustment for age, education, body mass index, diabetes, hypertension, heart attack, antidepressant use, and baseline cognition, women with Pattern 1 [HR (95% CI) = 2.23 (1.25,4.01)] or Pattern 2 [HR (95% CI) = 2.26 (1.35,3.79)] had more than twice the mortality risk compared to women with Pattern 3. When individual sleep change parameters were examined, the association with mortality risk was particularly strong for increased TST, napping duration, and reduced circadian amplitude and regularity.
Conclusion: Among women in their 80s, those with increased nighttime and daytime sleep duration, decreased nighttime sleep quality or reduced circadian rhythmicity over 5 years had double the risk of all-cause mortality compared to those with stable sleep. Sleep changes in late life may be important marker or risk factor for adverse aging outcomes.
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0727

SLEEP TIMING AND DEPRESSION RISK IN PREGNANCY

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Introduction: There is growing evidence that sleep timing is linked to health outcomes. Poorly timed sleep has been associated with metabolic risk factors and mood problems although there is a lack of data in the pregnant population. Emerging data suggest that late sleep timing during pregnancy may be associated with gestational diabetes, gestational hypertension, and preterm birth. However, data on sleep timing and mood during pregnancy are lacking.
Methods: Pregnant women were recruited from prenatal clinics at a large Midwestern tertiary referral center. Women were eligible if they were at least 18 years old and pregnant in their second or third trimester with a single fetus. There were no other exclusion criteria. Participants were queried about their sleep including questions about the time they went to bed, the time they woke up and their typical nocturnal sleep duration. Sleep mid-point was calculated as the time midway between bedtime and wake time and a delayed midpoint was defined as being after 4:00am. Demographic information was abstracted from medical records. Women were considered to have depression with a score of 13 or more on the Edinburgh Postnatal Depression Scale (EPDS) or a clinical diagnosis of depression.
Results: A total of 1349 women were included in the analysis, of which 15% were classified as having depression. Mean age was 30.7 years (SD 5.6 years) and mean gestational age was 33.8 weeks (SD 4.3 weeks). Overall, 26% of women had a sleep midpoint after 4:00am. In a regression model, women with a delayed sleep midpoint had a significantly increased odds ratio for depression (OR 1.4, 95%CI 1.1-1.8), which did not appreciably change after controlling for age, race, presence of hypertension or diabetes, first pregnancy, marital status, and sleep duration (aOR 1.5, 95%CI 1.1-2.2).
Conclusion: We provide initial evidence suggesting a link between self-reported late sleep midpoint and depressive symptoms in pregnancy. Assessment of sleep timing during pregnancy may have potential for identification of women at risk of depression.
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0728

THE EFFECTS OF YOGA ON SLEEP QUALITY IN MENOPAUSAL WOMEN: A SYSTEMATIC REVIEW AND META-ANALYSIS

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Introduction: Sleep disturbance is a common complaint in menopausal women, which could be a consequence of several factors, including reproductive hormonal changes and menopausal symptoms. Previous studies identified the benefits of yoga in alleviating menopausal symptoms. We conducted a systematic review and meta-analysis of menopausal women to assess the effect of yoga on sleep quality and menopausal symptoms.
Methods: PubMed, Scopus, Ovid, the Cochrane Library, and Google Scholar were searched through July 2023. Randomized controlled trials (RCTs) evaluating the effects of yoga in

menopausal women, which reported quantitative data on sleep quality and menopausal symptoms, were included. The study protocol was registered on PROSPERO (CRD 42023464468).
Results: Thirteen RCTs (1,649 patients) were eligible for the meta-analysis. The meta-analysis of six RCTs (591 patients) did not demonstrate a statistically significant difference in the total score of the Pittsburgh Sleep Quality Index (mean difference -1.39; 95% CI (-3.69, 0.92); P = 0.24). On the contrary, the meta-analysis of eight RCTs (1,065 patients) revealed a significant improvement in the total score of the Menopausal Rating Scale (MRS) (mean difference -7.10; 95% CI (-11.27, -2.93); P = 0.0008). There were significant differences in the subscale of each symptom comprising the somato-vegetative, psychological, and urogenital subscales (somato-vegetative subscale: mean difference -2.64; 95% CI (-4.93, -0.35); P = 0.02, psychological subscale: mean difference -3.43; 95% CI (-5.76, -1.11); P = 0.004, and urogenital subscale: mean difference -1,25; 95% CI (-2.30, -0.21); P = 0.02).
Conclusion: The pooled results did not demonstrate the significant benefits of yoga on sleep quality in menopausal women. Conversely, the remarkable advantages of yoga in relieving menopausal symptoms were illustrated. To further explain the benefit of yoga on sleep quality in menopausal women, additional longer-duration yoga training or longer-term studies would be required.
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0729

THE INFLUENCE OF SEXUAL ORIENTATION AND SOCIO-DEMOGRAPHICS ON SLEEP AFTER A DEPRESSIVE EPISODE

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Introduction: Our study addresses the gap in understanding sleep health among adults with depressive episodes, where sleep disturbances are common. We primarily investigate sleep disorder prevalence among sexual and gender minorities (SGM), while also examining the influence of sociodemographic factors in this context.
Methods: Our study analyzes data from the 2020-2021 National Survey on Drug Use and Health (NSDUH). The initial sample was 90,927, with an analytical sample of 15,244 after restricting the analyses to people experiencing depressive episodes. All estimates were weighted to account for the multistage sampling design. Descriptive statistics were used to estimate the prevalence of all variables of interest, including tobacco and nicotine use, age, gender, ethnicity/race, income group, marital status, education, and the year of data collection. Then, to examine these relationships in a multivariable manner, we computed generalized linear models (using Poisson and log-link) to estimate adjusted prevalence ratios for each covariate.
Results: Among participants with a history of depressive episodes, the majority identified as female (61.3%) and non-Hispanic White (71.3%). An estimated 82.3% of these individuals reported sleep difficulties in their lifetime. Within this subset, an estimated 4.63% (95% CI: 4.01-5.33) identified themselves as gay/lesbian, and an estimated 14.1% (95% CI: 13.0-15.2) as bisexual. Compared to heterosexuals, gay/lesbian individuals had 1.06 times the prevalence of sleep difficulties (p = 0.038), and bisexual individuals also had 1.06 times the prevalence of sleep difficulties (p = 0.009). Individuals who had completed a college degree or higher had 0.89 times lower prevalence of sleep difficulties compared to those who had not completed high school (p < 0.001). Finally, Hispanics had a 1.05 higher prevalence of sleep difficulties compared to non-Hispanic Whites (p = 0.015).
Conclusion: The study reveals significant disparities in sleep quality among different subgroups of individuals with depressive episodes. Gay/lesbian or bisexual individuals exhibit higher rates of sleep difficulties compared to their heterosexual counterparts. Furthermore, significant correlations were found between sleep difficulties and factors like ethnicity and educational attainment, suggesting a complex interplay of socio-demographic elements. These insights highlight the need for therapeutic strategies in mental health care that are cognizant of sexual orientation, educational background, and ethnicity.
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0730

IMMIGRATION STATUS AND ACCULTURATION LEVEL ARE PROSPECTIVELY ASSOCIATED WITH SLEEP IN A DIVERSE POPULATION OF WOMEN

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Introduction: Sleep, diet, and physical activity are key to cardiovascular health (CVH). Recent immigrants have healthier habits than native-born US adults, and greater acculturation is linked to poorer diets, less physical activity, and worse CVH. However, little is known about sleep in immigrant women. We aimed to investigate prospective associations between immigration status, acculturation, and sleep in a diverse sample of women from a New York City community-based cohort.
Methods: This prospective cohort study of 447 women (60.4% racial/ethnic minority, mean age=36.37±15.43 y) evaluated whether immigration and/or acculturation predicted sleep patterns at 1y follow-up. Immigration status, region of origin (Asia, Caribbean, Latin America, other), and acculturation measures including language preference, length of US residency, and age at immigration were self-reported at baseline. Sleep duration, quality, and sleep-onset latency were measured using the Pittsburgh Sleep Quality Index at baseline and 1y follow-up. Linear and logistic regression models were adjusted for age, health insurance, education, BMI, and corresponding baseline sleep measure.
Results: Among all participants, being born in the US was associated with poorer sleep quality (β:0.57, SE:0.25, p=0.022) at 1y. Among immigrant women, longer residency in the US (β:-0.02, SE:0.01 p=0.008), younger age at immigration (β:0.02, SE:0.01, p=0.012), and being from the Caribbean (β:-0.46, SE:0.19 p=0.017) were associated with shorter sleep duration at 1y. In logistic regression models adjusted for confounders, women who were from the Caribbean vs. other regions (OR:3.09, CI:1.13-8.51, p=0.029) and who had a longer US residency (OR:1.06, CI:1.02-1.10, p=0.002) had higher odds of sleeping < 7h/night. A lower risk of short sleep (< 7h/night) was observed among those who had been in the US for < 10y vs. ≥10y (OR:0.33,

CI:0.11-0.96, p=0.042) and with an older age at immigration (OR:0.94, CI:0.90-0.98, p=0.003).
Conclusion: Poorer sleep quality was reported by US born women, while shorter sleep was observed among immigrant women from the Caribbean compared to other regions, those with a younger age at immigration, and those with a longer residency in the US. These findings may help to identify women at greater risk for poor sleep and, consequently, at increased risk for poor CVH.
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0731
BISEXUAL WOMEN ARE MORE PRONE TO NIGHTMARES AND INSOMNIA COMPARED TO STRAIGHT WOMEN IN A SAMPLE OF COLLEGE STUDENTS

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Introduction: Frequent nightmare and insomnia severity are associated with sequelae including increased risk of substance abuse, cardiovascular disease, and suicide. Women and sexual minorities report higher incidence of nightmares and insomnia and as such may be at greater risk for negative associated outcomes. However, most research has consolidated all sexual minority members into a heterogeneous group. To address this gap, we investigated the risk of nightmares and insomnia among women who identified as heterosexual, lesbian, and bisexual.
Methods: Using the Student Trauma and Nightmare Development (STAND) data set, we analyzed the differences in frequency of nightmares and insomnia between straight and bisexual women. The data were collected from a sample of women enrolled at an American midwestern university (N = 957). Insomnia was measured using the 7-item Insomnia Severity Index (ISI) questionnaire. The 5-item Nightmare Disorder Index (NDI) questionnaire was used to assess the severity and frequency of one's nightmares. Sexual orientation could be endorsed as straight/heterosexual, gay/lesbian, bisexual, queer, asexual, prefer not to say, or prefer to self-describe. We fitted two general linear models using sexual orientation to predict insomnia and nightmare severity while controlling for age.
Results: Women who identified as bisexual reported significantly higher ISI and NDI scores compared to those identifying as a straight/heterosexual (NDI: β = -2.46, 95% CI: [-3.65, -1.26], $p < 0.001$; ISI: β = -2.52, 95% CI: [-4.00, -1.04], $p < 0.001$). There was no significant difference between straight/heterosexual women and lesbian women (NDI: β = 0.04, 95% CI: [-3.67, 3.76], p = .981; ISI: β = -2.85, 95% CI: [-7.464, 1.767], p = .226).
Conclusion: These results show that bisexual women in college may be at higher risk for insomnia and nightmares compared to heterosexual/straight college women. These findings highlight a significant sleep health disparity affecting bisexual women, a group with marginalized sexual identities. While these outcomes provide valuable insights, future studies should investigate the potential impact of trauma and utilize a larger and more diverse sample. This study may provide clinical utility for the treatment of bisexual women.
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0732
POOR PERINATAL SLEEP QUALITY IS ASSOCIATED WITH AN ELEVATED CORTISOL AWAKENING RESPONSE

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Introduction: The perinatal period is a time of disrupted sleep. Sleep quality progressively worsens across gestation and into the postpartum. A mechanism linking poor sleep with certain adverse pregnancy outcomes is dysregulation of the HPA axis resulting in atypically elevated cortisol production. Although total cortisol output normally increases across pregnancy, the cortisol awakening response (CAR) attenuates as pregnancy progresses, with normalization in the first couple of weeks after delivery. The objective of this study was to evaluate longitudinal associations between maternal sleep quality and indices of cortisol across the perinatal period.
Methods: Data were collected as part of the HB3 study. PSQI and saliva were collected at four time-points (8-16 weeks, 30-36 weeks, 6 months postpartum, and 1-year postpartum). Participants (N = 230) who had sleep and cortisol data from at least 1 of 4 time-points were included in analyses. Multi-level models were run to predict cortisol parameters based on deviations in average maternal sleep quality at each wave. Values below the detectable limit were imputed and samples taken < 20 minutes or > 60 minutes were excluded.
Results: Multilevel (time, wave, and person) modeling indicated an average positive CAR slope (g=0.29, p=.02) that was affected by whether sleep quality was better or worse at that wave (p=.04). When PSQI scores were higher than the woman's own average, the CAR slope was steeper (+1 point in PSQI, g=0.32), and when scores were lower than average, the CAR slope was flatter (-1 point, g=0.25). CAR slope was not affected by average sleep quality across waves (p=.21). Diurnal slope was not affected by sleep quality being better or worse at that wave (p = .82) or by average sleep quality across waves (p=.61).
Conclusion: Women with poorer sleep quality than their average had a larger CAR than women with better sleep quality than their average. There was no association between sleep quality and the diurnal slope. These data suggest that greater variability in sleep quality significantly increases the amount of cortisol secreted upon awakening. Further examination is needed to determine if sleep quality is associated with adverse pregnancy/delivery outcomes via HPA axis dysregulation.
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0733
ASSOCIATIONS BETWEEN MULTIPLE DIMENSIONS OF SLEEP AND COGNITION BY RACE/ETHNICITY AND GENDER

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Introduction: Sleep disturbances (including unhealthy duration, insomnia symptoms, and poor sleep quality) have been associated with impairments to memory and concentration. Although racially minoritized groups and women generally have poorer sleep quality and faster cognitive decline, few studies have investigated associations between multiple sleep dimensions and cognition by race/ethnicity and gender.
Methods: To investigate multiple sleep dimensions in relation to cognitive impairment, overall and by race/ethnicity and gender among US adults aged ≥40 years, cross-sectional data were pooled from the 2011-2018 National Health Interview Survey. Participants self-reported short (< 7 hours) and long (>9 hours) sleep duration and sleep disturbances (i.e., insomnia symptoms: trouble falling asleep and/or staying asleep 3+ nights/week; non-restorative sleep: waking up not feeling rested 4+ nights/week). Cognitive impairment (yes vs. no) was self-reported in one item of the Washington Group Short Set on Functioning and defined as either not being able to or having a lot of difficulty remembering and concentrating. Using Poisson regression with robust variance and adjusting for sociodemographic, health behavior, and clinical characteristics, we estimated prevalence ratios for associations between sleep dimensions and cognitive impairment, overall and by race/ethnicity and gender.
Results: Among, 73,477 participants, mean age was 58.3±0.7 years, and most (86.7%) attained high school or higher education. Overall, 2.2% had cognitive impairment (by race/ethnicity: Latinx (2.5%), Asian (1.6%), Black/African American (2.5%), and White (2.1%); by gender: women (2.4%), men (1.9%)). Short sleep was associated with higher prevalence of cognitive impairment only among White adults (PR=1.30 [95% CI:1.10-1.55] vs. range: PR-Asian=0.69 [95% CI:0.33-1.45] to PR-Latinx=1.14 [95% CI:0.75-1.73];p-interaction< 0.05) Although long sleep duration was associated with a higher prevalence of cognitive impairment among the overall population (PR=4.10 [95% CI:3.48-4.83]), associations were strongest among Asian adults (PR=5.27 [95% CI:2.84-9.80]; p-interaction< 0.05). Both insomnia symptoms (PR=1.40 [95% CI:1.40-1.87) and non-restorative sleep (PR=1.67 [95% CI:1.44-1.94) were associated with a higher prevalence of cognitive impairment across racial/ethnic groups. No associations varied by gender.
Conclusion: Short and long sleep, insomnia symptoms, and non-restorative sleep were associated with cognitive impairment with potential differences by race/ethnicity for sleep duration. Future studies identifying factors driving observed disparities by race/ethnicity and gender are warranted.
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0734

EARLY LIFE TRAUMA IMPACTS ADULT'S SLEEP VALUATION IN A SAMPLE OF AFRICAN AMERICAN COUPLES

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Introduction: Sleep value is the worth placed on sleep. The Sleep Valuation Item Bank (SVIB) is a novel questionnaire designed to capture the basic dimensions of sleep. The latent structure of sleep value has been tested in several nationally representative samples and college students. Distinct patterns have emerged across demographic and sleep variables. This study sought to outline the factor structure of the updated SVIB in African American couples (97% married) and explore how early life trauma impacts sleep value in adulthood.
Methods: Participants (30+/-4 years of age) in a committed relationship (6.6+/-3 years in a relationship) completed an online survey that included demographic variables, the SVIB, and the Childhood Trauma Questionnaire (CTQ). The factor structure of the SVIB was determined using principal axis factoring with a Promax solution. Factors scores were extracted using the Barlett method and correlated with CTQ subscores: emotional, physical, and sexual abuse and emotional and physical neglect.
Results: The scree plot method, eigenvalues greater than 1, model fit indices (BIC=-2667, $\chi 2$=<.001, CVE=.44, TLI=.84, and RMSEA=.054), and conceptual considerations of item fit suggested the presence of 5 factors: sleep devaluing, wanting, prioritizing, preferring, and enjoyment/liking. With the exception of emotional abuse, early life trauma was related to an ambivalent sleep value pattern characterized by lower sleep devaluing (r=-.69), greater sleep wanting (r=.24), and preferring to go to sleep when sleepy at night (r=.22) on the one hand, while enjoying sleep less (r=-.33) on the other (p<.05, for all). Emotional abuse was unique in that they tended to prioritize sleep less (r=-.15) and had the highest negative correlation with sleep enjoyment (r=-.44, p<.05 and .01, respectively).
Conclusion: Our results generally support previous analyses in other samples suggesting the SVIB captures a 5-factor structure of sleep value. This study extends those findings to African American couples. These findings suggest that early life trauma has a highly significant impact on sleep value in adulthood making it more desirable but less enjoyable. Emotional abuse in particular may lead to less prioritizing of sleep and more negative experiences with sleep.
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0735

A PRELIMINARY COMORBIDITY PROFILE FOR PATIENTS WITH INSOMNIA AND DAYTIME SLEEPINESS IN VA SUBACUTE REHABILITATION

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Introduction: Insomnia symptoms during inpatient rehabilitation are associated with slower recovery progression and longer lengths of stay. In addition to addressing environmental and behavioral factors, understanding medical and psychiatric comorbidities may help clinicians identify patients in most need of insomnia-related assessment, monitoring, or treatment. The present preliminary analysis aimed to characterize the comorbidity profiles of patients with insomnia symptoms and daytime sleepiness newly admitted to a VA subacute rehabilitation neighborhood.
Methods: 48 Veterans (Mage=72.8±12.1; 97.9%male; 79.2%white) were admitted to the neighborhood following hospital discharge during a 6-month period. Reasons for admission included short-term rehabilitation following acute illness or injury or worsening of an existing medical condition. Within 7 days of admission, Veterans completed the Insomnia Severity Index(ISI) and Epworth Sleepiness Scale(ESS). Medical and

psychiatric diagnoses were obtained from electronic medical records. Comorbidity profiling was determined through frequency analyses.
Results: 52.1%(n=25) of Veterans endorsed at least subthreshold insomnia (ISI≥8), and 33.3% (n=16) of Veterans endorsed excessive daytime sleepiness (ESS>10). For Veterans with at least subthreshold insomnia OR excessive daytime sleepiness, the following medical comorbidities were most prevalent: circulatory disease (e.g., coronary artery disease, hypertension) (80%;93.8%) and pain disorder (e.g., spinal stenosis) (76%;75%), respectively. For Veterans with at least subthreshold insomnia OR excessive daytime sleepiness, the following psychiatric comorbidities were most prevalent: anxiety disorder (44%;68.8%), and history of substance use disorder (e.g., alcohol use disorder) (44%;43.8%), respectively. Prevalence of circulatory disease (89%) and pain disorder (90.1%) were more pronounced among Veterans with clinical insomnia (n=11)(ISI ≥ 15), though these findings were not significant.
Conclusion: While this work is preliminary, the findings support that it may be beneficial for clinicians to assess sleep difficulties upon admission to subacute rehabilitation settings. This may be especially important for patients with medical comorbidities, such as circulatory disease and pain disorders, and/or psychiatric comorbidities, such as anxiety disorder and substance use disorder. Future evaluations should include larger, more diverse samples and longitudinal designs to identify which comorbidities are primary risk factors for greater insomnia severity and daytime sleepiness during subacute rehabilitation. Understanding these risk factors would be essential to addressing insomnia and daytime sleepiness during rehabilitation in order to optimize recovery.
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0736

ASSOCIATION OF EXCESSIVE SLEEPINESS WITH ALL-CAUSE MORTALITY AMONG OLDER ADULT US VETERANS

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Introduction: The association between excessive daytime sleepiness (EDS) and all-cause mortality remains uncertain. We investigated the relationship between EDS and all-cause mortality along with other factors including comorbid conditions.
Methods: We included patients who had visited the Veterans Health Administration (VHA) between FY 1999 and the end of 2022; and those who had been assigned ICD codes 9/10 of any sleep disorders or CPT codes of sleep studies. We developed and validated a Natural Language Processing (NLP) algorithm to extract Epworth sleepiness scale (ESS) from unstructured free-form text from physician notes. We assessed the NLP pipeline's performance using 470 patient notes that were manually annotated. We defined EDS as an ESS≥11. We categorized the patients into two groups: normal (ESS ≤10) and sleepy (ESS >10). Control factors were the most important variables determined through a machine learning algorithm. We reported adjusted odds ratios (aOR) and 95% confidence intervals (95%CI) from logistic regression models using most important factors. The process was separately applied to two distinct groups of veterans: those younger than 50 years and those aged 65 years or older.
Results: Out of 423,087 unique patients with ESS, 116,581 (27.6%) were older adults where 71,913 were grouped as normal and 44,668 as sleepy. Among young adults, only depression considered as the most important factor for all-cause mortality and all-cause mortality rates did not differ between normal and sleepy groups. For older adults, 33 factors including ESS were considered as the most important variables. The aOR of all-cause mortality was 21% higher in Sleepy compared Normal (aOR,1.21;95%CI:1.17,1.24). Among the comorbid conditions, the prevalence of diabetes, depression, heart failure, renal disease, PTSD, and cerebrovascular disease were higher in Sleepy compared to the Normal.
Conclusion: In sharp contrast to younger adults, excessive daytime sleepiness, as measured by ESS, predicted higher mortality in older adults. The presence of important comorbid conditions in older adults most likely plays a causal role. Chronic comorbid conditions may disturb sleep and result in excessive daytime sleepiness.
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RETIREMENT, HEALTH-RELATED QUALITY OF LIFE, AND SLEEP IN OLDER ADULT VETERANS

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Introduction: Retirement is a major life transition. Prior evidence suggests that retired individuals have better sleep quality than working individuals, though may also exhibit worse physical and mental health-related quality of life (HRQOL). Few studies have examined how retirement can impact the relationship between sleep and HRQOL, particularly among veterans who often face greater impairments in sleep and health.
Methods: Secondary analyses were conducted in a sample of 346 older veterans (mage=64, 47% white) with suspected co-morbid sleep apnea and insomnia. Measures included retirement status (retired/not retired), the Insomnia Severity Index (ISI), Pittsburgh Sleep Quality Index (PSQI), and Short-Form Health Survey (SF-12) encompassing both physical (SF-P) and mental health-related (SF-M) quality of life. Multiple regression analyses were conducted, with each model containing one sleep variable (ex. ISI), retirement status, and statistical interactions predicting SF-M or SF-P.
Results: All models were statistically significant. Retirement status was a significant predictor of SF-P across models (-4.52< b<-4.22, p≤.001), but was not a predictor of SF-M. When

coupled with PSQI, the relationship between PSQI and SF-P was moderated by retirement status (b=-.68, p=.02), with retired individuals endorsing lower SF-P with poorer sleep quality compared to non-retired individuals. PSQI was also a significant predictor of SF-M (b=-1.27, p<.001). ISI was a significant predictor of both SF-P (b=-.41, p=.01) and SF-M (b=-.9, p<.001).
Conclusion: Poor sleep and being retired are associated with poor physical HRQOL, with physical HRQOL being particularly impacted by sleep quality in veterans who are retired. In contrast, only poor sleep functioning appeared to impact mental HRQOL. Findings from this study highlight the importance of sleep-related factors in maintaining HRQOL as well as the role retirement can play in physical HRQOL.
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DIFFERENCES IN PERCEPTION IN SLEEP IN INDIVIDUALS WITH DEMENTIA AND COGNITIVE IMPAIRMENT

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Introduction: Normal aging is associated with changes in an individual's sleep. Individuals with dementia and cognitive impairment have greater dysregulated sleep. These patients may have difficulty reporting sleep problems reliably or may have a distorted perception of their sleep quality. In this study, we examined how older patients with and without cognitive impairment compared with respect to objective and subjective measures of sleep, with a focus on perception of sleep onset latency (SOL) and total sleep time (TST).
Methods: We performed a retrospective review of diagnostic and PAP Titration polysomnograms from 2022 that were performed for patients ages 60-95 with a diagnosis of dementia or cognitive impairment (impaired group). An age-matched control group was also found in this fashion (control group). These polysomnograms were performed and scored in accordance with the AASM guidelines. Data regarding sleep time, SOL, Apnea-Hypopnea Index (AHI) and perceptions on TST and SOL were collected. A student T-test was used to compare measures in these groups.
Results: We identified 35 patients who were in the cognitively impaired group (mean age = 73) and 35 age-matched controls (mean age = 71). The average objective sleep latency for the impaired and control groups did not differ (26 minutes and 24 minutes, p=0.73), neither the average total sleep time (312 minutes and 309 minutes, p=0.86) nor the average AHI (12.9 and 17.5, p=0.34). The impaired group more frequently overestimated their perceived sleep latency (+62 minutes versus +22 minutes, p=0.02); however, the groups did not differ in their estimation of TST (p=0.16).
Conclusion: Our study found that patients with cognitive impairment overestimate how long it takes them to fall asleep compared to objective measures and their age match controls. Although many factors may contribute to this discrepancy, these findings suggest more thorough screening of sleep problems should be considered prior to initiation of interventions in individuals with cognitive impairment.
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0739

DOES BENZODIAZEPINE RECEPTOR AGONIST USE, INSOMNIA, AND OSA EXPLAIN VARIATION IN COGNITIVE PERFORMANCE?

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Introduction: Older adults have multiple risk factors for cognitive impairment including insomnia, benzodiazepine receptor agonist (BZRA) use, and obstructive sleep apnea (OSA). Simultaneously addressing all risk factors is ideal but impractical. Clarifying the relative contribution of each risk factor could help prioritize strategies to reduce risk of cognitive impairment. We sought to quantify the effects of sleep risk factors on cognitive performance above and beyond other common risk factors for cognitive impairment.
Methods: We used clinical trial baseline data from outpatients taking a BZRA hypnotic. In four nested regression analyses, we modeled predictors of Mini-Mental State Examination (MMSE), Trail Making Test (TMT) A, TMT B, and Digit Symbol Substitution Test (DSST). Base Models included age, sex, ethnicity, race, education, vascular risk, depression, traumatic brain injury, and alcohol use. Nested models were: Model 2 = base model + Insomnia Severity Index score (ISI); Model 3 = Model 2 + BZRA hypnotic use; Model 4 = Model 3 + OSA risk; and Model 5 = Model 4 + OSA-BZRA interaction term. We compared changes in R-squared values and used F-tests to examine the fit of nested models.
Results: Of 348 participants (mean age 68.8), 313 were included for MMSE (m=28.2), 298 for TMT-A (m=48.2 seconds), 287 for TMT-B (m=130.2 seconds), and 285 for DSST (m=8.0) analyses. Mean ISI was 14.2 (SD 6.6). Mean 7-day BZRA total dose was 29.5 diazepam equivalents milligrams (SD 31.4). 44% were high-risk for OSA. Base Model R-squared was 0.139 (MMSE), 0.241 (TMT-A), 0.229 (TMT-B), and 0.189 (DSST). Change in R-square from Model 1 to Model 5 was 0.003 (MMSE), 0.005 (TMT-A), 0.010 (TMT-B), and 0.001 (DSST), with p-values >.145 for F-tests comparing changes in R-squared. Change in R-squared for Models 2 to 3, 3 to 4, and 4 to 5 were not statistically significant.
Conclusion: Although our base models account for more than 13% of the variation in cognitive performance, sleep variables

did not significantly explain additional variation in cognitive performance. These results suggest that in older adults using BZRAs, interventions targeting common risk factors should be prioritized to address cognitive impairment.

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0740

DOES XX OR XY MARK THE SPOT: SEX-SPECIFIC ANALYSIS OF POLYSOMNOGRAPHIC SLEEP AND COGNITION IN OLDER ADULTS

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Introduction: Poor sleep health is a proposed risk factor for Alzheimer's disease (AD). Despite known sex differences in AD prevalence (higher in women), whether sex impacts associations between objective sleep parameters and specific cognitive functions remains underexplored. Such investigations are warranted and will provide information regarding potential sex-specific targets for early intervention and/or markers of AD risk. This study tested whether sex moderates associations between polysomnographic assessed sleep and cognition in older adults.

Methods: Older adults (Mage=68.2±5.5; 44 women/29 men) completed overnight polysomnography (Sleep Profiler) and cognitive tasks [NIH Toolbox: Pattern Comparison (processing speed), Oral Symbol Digit Test (attention and processing speed), List Sorting (working memory), Auditory Verbal Memory Task (episodic memory), Flanker (inhibition), Dimensional Change Card Sort (cognitive flexibility)]. Multiple regressions examined whether sleep metrics (sleep onset latency, wake time after sleep onset, sleep efficiency, total sleep time), macro-architecture (%N1-N3, %REM) or micro-architecture (sleep spindle duration and index) interacted with biological sex in associations with cognition, controlling for age, education and apnea-hypopnea index.

Results: Sleep onset latency (R-squared=.06, p=.03) and sleep spindle duration (R-squared=.05, p=.05) interacted with sex in their associations with cognitive flexibility. Specifically, in women (not men), longer sleep onset latency (B=-.01, SE=.002, p=.03) and longer spindle duration (B=-.08, SE=.03, p = .005) were associated with worse cognitive flexibility.

Conclusion: The link between polysomnographic sleep and cognitive flexibility in older adults may be sex dependent. Sleep onset latency cognitive (rumination/worry) and neural (physiological arousal/pre-frontal activation) mechanisms may interact with female sex-steroid alterations (postmenopausal drops in circulating estrogen and progesterone) and exacerbate its negative impact on cognitive flexibility. We also speculate that longer sleep spindle duration in the presence of dysfunctional cognitive flexibility may reflect compensatory thalamo-prefrontal cortical regulation (greater need for nighttime cognitive/cortical arousal reduction) that is further influenced by prefrontal sex-steroid mechanisms. Longitudinal studies in larger samples of cognitively healthy and impaired older adults are needed to further understand whether polysomnographic sleep metrics represent sex-specific markers of future cognitive decline.

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0741

EFFECTS OF LIGHT EXPOSURE ON SLEEP, REST-ACTIVITY RHYTHMS, AND COGNITIVE FUNCTION IN ADULTS WITH HEART FAILURE

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Introduction: Sleep disturbance and circadian rhythm disruptions are common among adults with chronic heart failure (HF), and are related to cognitive impairment. Although light levels are known to influence sleep quality, cognition, and the circadian system, little is known about the role of light among adults with HF. The purpose of this study is to investigate the association between light exposure and sleep, diurnal rest-activity rhythms (RAR), and cognitive function among adults with HF.

Methods: We retrospectively analyzed baseline data from a randomized controlled trial of cognitive behavioral therapy for insomnia for adults with HF and insomnia. We measured light levels and sleep with 24-hour wrist actigraphy and computed the circadian quotient, inter-daily stability, and intra-daily variability (strength of the RAR) using cosinor and non-parametric methods. We computed time above threshold (TAT) (100, 500, and 1000 lux), ratio of light exposure in daytime to evening (AUC ratio), and light regularity index (LRI) (20, 50, and 100 lux) to assess the intensity and consistency of light exposure patterns. Lapses in performance on the Psychomotor Vigilance Task (PVT lapse) measured cognitive function. Multiple linear regressions tested if the light exposure metrics could predict the RAR, sleep efficiency, and PVT lapses after adjusting for age, sex, and comorbidities.

Results: The sample included 167 participants (M age=63.8 (SD =12.9) years; 45.5%female). The AUC ratio and TAT500 were associated with a stronger circadian quotient in males (0.339 ± 0.095, p=.0005; 0.296 ± 0.085, p=.0006) compared to females (0.058 ± 0.106, p=.5800; -0.061 ± 0.128, p=.6364), after controlling for age and comorbidities. TAT500 was associated with better inter-daily stability (0.221 ± 0.077, p=.0044) than the other thresholds. Higher light exposure intensity (TAT100) (0.129 ± 0.065, p=.0492) and a greater circadian quotient (0.267±0.076, p=.0006) were associated with improved sleep efficiency. TAT100 was associated with fewer PVT lapses (-0.229 ± 0.082, p=.0061), after controlling for total sleep time, circadian quotient, and demographics.

Conclusion: Light exposure, particularly at certain intensities and regularity, predicted RARs, sleep efficiency, and cognitive function in adults with HF. Future tailored light interventions

with varying intensities and regularity may improve HF outcomes.

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0742

SLEEP AND COGNITION IN OLDER ADULTS: THE ROLE OF SUBJECTIVE COGNITIVE BELIEFS

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Introduction: Sleep is vital for an individual's cognitive functioning and changes in sleep and cognition are common as individuals age. In older adults, subjective cognitive beliefs are a robust predictor of subsequent objective cognitive decline. Although sleep is consistently associated with subjective cognitive beliefs, its association with objective cognitive functioning is less well defined. This study aimed to examine whether sleep may be associated with objective cognitive functioning through its association with subjective cognitive beliefs in community-dwelling older adults.

Methods: Participants (N=365) were middle-aged and older adults (Mage=62.8, 59.7% female) who participated in an online study including questionnaires (Insomnia Severity Index, RU-SATED sleep health questionnaire, Karolinska Sleepiness Scale, and the Everyday Cognition Scale) and objective cognitive testing assessing the following domains: impulsivity, executive function, memory, and attention. Bivariate correlations and linear regression analyses examined direct associations between variables. Mediation was examined via SPSS PROCESS macro to determine whether subjective cognitive beliefs mediated the associations among sleep characteristics and objective cognitive functioning.

Results: Better sleep (i.e., less insomnia symptoms and sleepiness, better sleep health) was associated with more positive subjective cognitive beliefs (all p's<.05). Additionally, less insomnia symptoms (impulsivity, executive functioning, memory), less sleepiness (impulsivity, executive functioning, memory, attention), and better sleep health (executive functioning, memory) were associated with better objective cognitive functioning (all p's<.05). Mediation analyses revealed that subjective cognitive beliefs fully mediated the associations between the following: (1) Insomnia and impulsivity and memory (2) Sleepiness and impulsivity, memory, and executive functioning (3) Sleep health and memory and executive functioning. Subjective cognitive beliefs only partially mediated the associations between the following: (1) Insomnia and executive functioning and (2) Sleepiness and attention.

Conclusion: Subjective cognitive beliefs play an important role in linking sleep behaviors to objective cognitive functioning in older adults. In fact, many of the sleep—cognitive functioning associations were found to be fully mediated by subjective cognitive beliefs. As beliefs about cognitive functioning are an important predictor of pathological cognitive aging, interventions aimed at improving both sleep and cognitive functioning that utilize social learning principles, such as self-efficacy, may be particularly efficacious.

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0743

ASSOCIATION OF CIRCADIAN TIMING WITH INCIDENT DEMENTIA: THE KOREAN GENOME AND EPIDEMIOLOGY STUDY

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Introduction: Circadian rhythm disruption is common in neurodegenerative disorders such as dementia. Especially, preference for circadian timing (e.g., chronotype) mainly affects cognitive and memory function. Previous studies reported that individuals with earlier chronotype may be useful predictor of poor neurocognitive outcomes and accelerated brain aging, but there is still not adequate strong evidence regarding the relationship between chronotype and dementia. The aim of the present study is to examine the associations between different chronotype and incident dementia through middle-aged to older general population.

Methods: A total 9541 participants of the Korean Genome and Epidemiology Study – Ansan and Ansung (mean age, 52.2±8.9), who have been linked to the Health Insurance Review and Assessment Service national database to assess incident all-cause and sub-type of dementia were analyzed. The mid-point sleep (MST) was defined as the midpoint between bedtime and wake time and used to categorize the participants into three groups (earlier-, intermediate-, and later-type). In multivariate Cox regression analysis, we adjusted for age, sex, area, marital status, education level, body mass index, smoking and drinking status, regular exercise, hypertension, diabetes, depression, hyperlipidemia, heart, and cerebrovascular disease at baseline.

Results: During the mean follow-up of 17.7 years, dementia was diagnosed in 1236 participants (588 with Alzheimer's disease (AD)). Among total participants at baseline, 13.0% were 65-69 years of age and 52.9% were women. Compared to the intermediate-type (-1SD (1.3 h) ≤ MST ≤ +1SD (3.6 h)), adjusted hazard ratio (HR) of all-cause dementia were 1.19 (95% CI, 1.04-1.36) in the earlier-type (<-1SD). In addition, earlier-type was associated with greater risk of AD (HR = 1.22; 95% CI, 1.02-1.47). However, these associations were not shown in later chronotype (>+1SD).

Conclusion: Our findings suggest that early mid-point of sleep was prospectively associated with an increased risk of all-cause dementia and Alzheimer's disease among middle-aged or older adults.

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0744

METRICS OF SLEEP APNEA SEVERITY AND SLEEP-DEPENDENT MEMORY CONSOLIDATION

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Introduction: Obstructive sleep apnea (OSA) is common in older adults and has recently been implicated in the pathogenesis of Alzheimer's disease (AD). Sleep disruption is a possible reversible cause of memory impairment. Furthermore, quality of sleep has been determined to be one of the most important variables affecting overnight memory consolidation. As part of a larger study, data are presented evaluating correlations between markers of sleep apnea severity and sleep-dependent memory consolidation.
Methods: Seventy-one older adults ages 65-83 (M=70, SD=4.1) with normal cognition underwent polysomnography (PSG) and completed sleep questionnaires as part of a larger study. The sample was 54.9% women, 83.1% White, and 91.5% Non-Hispanic. Severity of sleep apnea was assessed using several metrics: Daytime sleepiness measured by the Epworth Sleepiness Scale (ESS), apnea-hypopnea index (AHI) based on American Academy of Sleep Medicine recommended, Total Sleep Time with Oxygen Saturation below 90% (T90), the lowest level of oxygen saturation reached during sleep (SPO2 Nadir), and hypoxic burden. Sleep-dependent memory consolidation was assessed using the Word-pairs Association (WPA) task, which shows semantically related word pairs for 5 seconds for the participant to learn, and the next morning, post-sleep, the delayed recognition test is performed.
Results: Descriptive analyses showed a median daytime sleepiness of 7 (SD=3.1), AHI of 28 (SD=24.3), and body mass index of 27 (SD=7.1). Nonparametric correlations were performed to assess markers of sleep apnea severity as correlates of sleep-dependent memory consolidation. There were no significant associations between objective measures of OSA severity, particularly AHI, hypoxic burden, T90, and SPO2 Nadir. However, there was a significant negative association between subjective daytime sleepiness (ESS) and sleep-dependent memory consolidation (r=-0.30, p=0.01).
Conclusion: This study provides preliminary insights into the association between daytime sleepiness and sleep-dependent memory consolidation. The observed finding that lower daytime sleepiness is related to better sleep-dependent memory consolidation warrants further investigation into the underlying mechanisms and to assess whether alternate cognitive measures may be associated with objective severity metrics. Future research should assess relations with psychological factors, such as mood and coping, as these factors can impact memory and are not captured by PSG.
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0745

PREVALENCE OF SLEEP DISORDERS IN DEMENTIA PATIENTS- A DEMOGRAPHIC ANALYSIS

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Introduction: The prevalence of sleep complaints in the general population far surpasses that of sleep disorders, mainly due to under-recognition. In patients with dementia, the prevalence of sleep disorders is even more vague, despite growing interest in the association between neurodegeneration and sleep disturbances. This project aims to understand the prevalence of sleep disorders in dementia patients, overall and across demographics.
Methods: Data was analyzed from the outpatient EMR in the UTHealth Neurosciences clinic from January 1, 2022-December 18, 2023. 12,187 patients with a dementia diagnosis were selected. ICD-10 codes identified patients with concomitant sleep-related diagnoses. The cohort was analyzed by race and gender. Percentages of patients with sleep apnea and insomnia were also identified.
Results: The sample of dementia patients included 5354 white, 2846 black, 2273 other, 663 Hispanic, 489 unknown, 455 Asian, and 25 American Indian or Alaska natives. Among these, 22% white, 21% black, 20% other, 24% Hispanic, 18% unknown race, 17% Asian, and 36% American Indian or Alaska Native patients carried a sleep disorder diagnosis. We note that a comparatively small number, only 25 American Indian or Alaska Native patients were included in the analysis, which might account for the disproportionate sleep disorder prevalence in that group. Regarding gender, the patients consisted of 1069 female and 5108 male patients with dementia. Of these, 20% of female and 22% of male patients carried sleep-related diagnoses. 13.4% were given a diagnosis of insomnia and 7% of sleep apnea. 5% of female and 9 % of male patients had sleep apnea. 14% of female and 12% of male patients were diagnosed with insomnia. Other sleep disorders were not separately identified. The overall percentage of dementia patients with sleep-related diagnoses was 21%.
Conclusion: The prevalence of sleep disorders in patients with dementia was about 20%. Similar to the general population, the most common sleep disorder diagnosis was insomnia, with sleep apnea being a close second. Also, similar to the general population, insomnia was more common in female patients and sleep apnea in male patients. There were no significant differences in the frequencies of sleep-related diagnoses among dementia patients in racial and gender groups.
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0746

RESTED AND CONNECTED: AN EXPLORATION OF SLEEP HEALTH AND LONELINESS ACROSS THE ADULT LIFESPAN

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Introduction: The 2023 U.S Surgeon General's Advisory identified loneliness as a major public health concern. Growing research in this area has identified a relationship between loneliness and poor sleep outcomes in different age groups; however, few studies have explored the relationship between loneliness and sleep health. As such, the present study evaluated the association between loneliness (including social and emotional loneliness subtypes) and sleep health across the adult lifespan.
Methods: Participants included adults across the lifespan (N=2297, Mage = 44 years, 49% female) who completed an online study which included the RU-SATED sleep health questionnaire

and the Gierveld Loneliness scale. Correlation and linear regression analyses were utilized to examine direct associations between sleep health, age, and loneliness. The total score and the subscales (emotional and social loneliness) of the Gierveld Loneliness scale were examined to investigate if components of loneliness were differentially associated with sleep health. Moderation analyses examined whether the link between sleep health and loneliness differed by age. Separate moderation models were constructed for each loneliness outcome (i.e., total, emotional, or social), with sleep health, age, and their interaction as predictors.
Results: Better sleep health and younger age were associated with significantly lower loneliness total and subscale scores (all p's <.05). Age significantly moderated the association between sleep health and total loneliness scores and emotional loneliness scores (b = 0.01, t = 2.63, p = .009; b = 0.04, t = 3.15, p = .002, respectively); but did not moderate the association between sleep health and social loneliness (b = 0.02, t = 1.54, p = .124). Specifically, while better sleep health was associated with lower loneliness across ages, this association was stronger at younger ages.
Conclusion: Results suggest that younger age groups may be more prone to the positive effects of better sleep health on loneliness, especially emotional loneliness, compared to older age cohorts. Promoting sleep health may be an untapped avenue to support efforts and programs that aim to reduce loneliness and increase engagement in all age groups, but especially in younger ages. Future research should consider monitoring sleep health in programs or interventions that address loneliness.
Support (if any):

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0747

TIRED AND LONELY: AN EXPLORATION OF INSOMNIA SYMPTOMS AND LONELINESS ACROSS THE ADULT LIFESPAN

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Introduction: Prior research has identified associations between poor sleep and loneliness; however, this research predominantly focused on a limited age range within adult populations. Very few studies have explored associations between insomnia symptoms (e.g., sleep disturbances, daytime dysfunction) and loneliness and how age might influence these associations across the adult lifespan. As such, the present study evaluated the association between insomnia symptoms and loneliness across the adult lifespan.
Methods: This online study surveyed adults across the lifespan (N=2297, Mage=44 years, 49% female) with the Insomnia Severity Index and the Gierveld Loneliness scale. Correlation and linear regression analyses were utilized to examine direct associations between insomnia symptoms, age, and loneliness. The Gierveld Loneliness total score and subscales (emotional and social loneliness) were used to investigate if aspects of loneliness were differentially associated with insomnia symptoms. Moderation analyses examined if the association between insomnia symptoms and loneliness differed by age. Each loneliness outcome (i.e.,total, emotional, and social) was included in a separate moderation model, with insomnia symptoms, age, and their interaction as predictors.
Results: Greater insomnia severity and older age were both significantly associated with higher loneliness total and subscale scores (all p's<.05). Age significantly moderated the association between insomnia symptoms and total and emotional loneliness scores (b = -0.02, t = -2.30, p=.02; b = -0.002, t = -2.88, p=.004, respectively); but did not moderate the association between insomnia symptoms and social loneliness (b = -0.001, t = -1.25, p=.212). Specifically, the strength of the association between insomnia severity and loneliness differed by age, with older adults displaying weaker associations between insomnia symptoms and loneliness compared to younger ages.
Conclusion: Insomnia symptoms are associated with loneliness across the lifespan. However, age moderated this association such that in older age cohorts the link between insomnia symptoms and loneliness, while still significant, was weaker than in younger cohorts. Efforts aimed at reducing loneliness in older adults should incorporate components of evidence-based insomnia treatments. Given the cross-sectional nature of this study, future research is needed to determine if lower levels of loneliness might be protective against developing insomnia in older adulthood.
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0748

SLEEP VALUE PROFILES–WHICH TYPE ARE YOU?

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Introduction: Sleep value, the worth placed on sleep, is an important dimension of sleep health. Using the Sleep Valuation Item Bank (SVIB) we have previously found associations between sleep value factors and demographic, sleep, and psychological variables. The patterns of sleep value hint that there may be distinct sleep value profiles. In a nationally representative sample of 454 participants, we sought to identify these profiles and explore whether they differ in demographic features.
Methods: Participants ages 18-85 (M = 45) completed an online Qualtrics survey that included demographic variables and the SVIB. The factor structure of the SVIB was confirmed using factor analysis. Latent profile analyses with the confirmed factors were conducted and multiple models were compared to identify the best-fitting sleep value profiles. Multiple regression was used to explore whether these profiles differed in age, gender, marital status, income, education, having dependents, and race.
Results: Five sleep value factors were confirmed: sleep wanting, liking, devaluing, prioritizing, and preferring. Latent profile analysis found evidence for 5 classes, or sleep value profiles: (1) an indifferent profile who neither valued nor devalued their sleep who made up 25% of the sample, (2) sleep prioritizers who scheduled their lives around sleep made up 27% of the sample, (3) sleep devaluers made up 26%, (4) an ambivalent profile who highly valued and devalued sleep made up 15%, and (5) on 7% were sleep valuers. Those with the indifferent profile tended to be older (p < .001). Those with the ambivalent profile were more likely to be working-age adults (p < .001) and male (p < .05).
Conclusion: This study found distinct profiles of sleep value that differ in terms of demographics. Only 7% of our nationally representative sample had a profile suggesting they value sleep. The vast majority had an indifferent, ambivalent, or devaluing profile. Understanding how the patterns of sleep value develop and inform sleep-related behavior is an important avenue for future research. These findings may help personalize messaging for sleep health promotion.
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0749

A SOCIAL ECOLOGICAL PERSPECTIVE ON SLEEP HYGIENE HABITS IN OLDER ADULTS WITH HIV

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Introduction: Nearly 75% of people with HIV (PWH) report poor sleep quality, a risk factor for impairment in daily activities, poorer quality of life, and declines in physical and mental health. However, little is known about the multifactorial causes of poor sleep, rendering it difficult to treat. We examined sleep hygiene habits in PWH through qualitative and quantitative methods.

Methods: Using qualitative analyses, we examined sleep hygiene habits in older virally suppressed PWH on antiretroviral therapy who enrolled from December 2021 to September 2022 in this cross-sectional study. Individuals participated in semi-structured telephone interviews regarding sleep hygiene habits. Interviews were recorded, transcribed verbatim, and coded by three independent coders, codes were adjudicated and analyzed for common themes using Dedoose 9.0.82 software. The Social Ecological Model constructed with five levels: individual, interpersonal, organization, community, and policy served as the framework. Self-reported sleep quality data was measured with the Pittsburgh Sleep Quality Index (PSQI).

Results: Among 50 PWH, the mean age was 54 years, 32% were female (n=16), and 62% identified as African American/Black (n=31). The mean PSQI was 9 (median: 9, interquartile range: 5-14). The individual level themes identified were: 1) Shorter Sleep Duration and the Ripple Effect; 2) Poor Bedtime Habits; 3) The Sleep and Physical Activity Connection; and 4) Late Night Bites. The interpersonal level themes identified were: 1) Family Ties: The Impact of Family on Sleep; 2) Balancing Act: The Interplay between Work and Sleep; and 3) The Impact of Aging and Stimuli on Sleep. The theme at the organizational level identified was Sleep Health Neglect, that refers to a lack of adherence and continuity of sleep health care.

Conclusion: Poor sleep habits including lack of physical activity and late-night eating, family, work, aging, internal and external stimuli compete with the opportunity to sleep and contribute to inadequate amounts of sleep and/or poor quality sleep. Moreover, the lack of adherence and continuity of sleep health care also negatively impacts the perceived sleep quality of aging PWH. Future studies should consider a multimodal intervention approach to mitigating poor sleep quality in this population.

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0750

ASSOCIATION BETWEEN PHYSICAL ACTIVITY AND SLEEP QUALITY IN OLDER ADULTS AND THE MEDIATION OF PAIN

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Introduction: Sleep disturbances are more prevalent in older adults. Both physical inactivity and pain have been linked to sleep disturbances in older adults, but the intricate interplay between these mechanisms is underexplored. This study investigates the associations between physical activity (PA) and sleep with both subjective and objective measures and the potential mediation of pain among community-dwelling older adults.

Methods: This cross-sectional study used baseline data of 125 community-dwelling older adults without dementia (Mean age = 70.45±6.18 years, 82.40% female, 57.60% White) who participated in a randomized controlled trial. PA and sleep were assessed objectively using ActiGraph Link and Actiwatch 2, and subjectively using Physical Activity Scale for the Elderly (PASE) and Pittsburgh Sleep Quality Index (PSQI). Pain intensity, interference, and behavior were assessed using PROMIS Pain Scales. Multiple linear regressions examined associations between PA and sleep quality, and Baron and Kenny's approach was used to explore the mediation of pain.

Results: Adjusted for age, sex, race, and comorbidities, higher PASE correlated with lower PSQI (β = -0.169, 95% Confidence Interval [CI]: -0.284, -0.053). Pain intensity (indirect effect: -0.039, 95% CI: -0.078, -0.001), pain interference (indirect effect: -0.042, 95% CI: -0.082, -0.002), and pain behavior (indirect effect: -0.035, 95% CI: -0.071, -0.002) were significant mediators. Objective PA was associated with shorter sleep onset latency (SOL) and reduced wake after sleep onset. Specifically, the association between objective PA and SOL was partially mediated by pain intensity (indirect effect: -0.076, 95% CI: -0.173, 0.022). Pain interference and behavior mediated the relationships between objective PA and self-reported sleep quality (indirect effects: -0.022, 95% CI: -0.045, 0.001 for interference; -0.017, 95% CI: -0.037, 0.003 for behavior).

Conclusion: Our findings reinforce the association between PA and better sleep quality using both self-reported and objective measures and validate the mediation role of pain measures. These results suggested a critical role of pain in shaping the dynamics links between PA and sleep quality. Given the cross-sectional nature of our data, future longitudinal studies are necessary to further explore these findings.

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0751

COMPARABILITY OF SELF-REPORTED & WEARABLE-MEASURED SLEEP & PREDICTORS OF AGREEMENT IN A PRECONCEPTION COHORT

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Introduction: Agreement between self-reported and device-estimated sleep duration has not been well studied among pregnancy planners. As data from wearables provide complementary information to self-reported sleep, assessment via wearable devices may improve characterization of sleep in naturalistic settings and better inform research on sleep health and reproductive outcomes.

Methods: We analyzed data from Pregnancy Study Online, an Internet-based prospective preconception cohort study. From

2021-2023, we invited U.S. residents aged 21-45 years with pregnancy attempt times ≤6 months at enrollment to participate in a study of wearable sleep-tracking devices. Enrolled participants wore a study-issued Fitbit Inspire 2/3 for 24 hours/day for up to two months and completed all other parent study activities. We examined agreement between self-reported sleep duration in the month before enrollment and device-estimated 30-day average sleep duration (hours/day) within two months after enrollment using Bland-Altman plots and Kappa statistics (one-hour intervals). We used log-binomial regression models to estimate prevalence ratios (PR) and 95% confidence intervals (CI) for predictors of agreement.

Results: Of the 1,523 invited participants (1,178 females and 345 males), 948 (62%) consented to participate (females: 67% vs. males: 47%). Self-reported sleep duration (median: 7.5; interquartile range [IQR]: 7.0-8.0 hours/day) was longer than wearable-measured (median: 7.2, IQR: 6.3-8.0 hours/day). Self-reported and wearable-measured sleep duration showed poor agreement (weighted Kappa: 0.12; 95% CI: 0.07-0.17). Comparing self-reported to wearable-measured sleep duration, the Bland-Altman plot yielded a mean difference of 0.2 hour/day (95% CI: -3.3-3.8). Outliers from the Bland-Altman plot indicate that participants with shorter wearable-estimated mean sleep duration overestimated their self-reported sleep duration, while participants with longer wearable-estimated mean sleep duration underestimated this measure. Among females, predictors of poorer agreement in short sleep duration (< 7 hours/day) included older age (≥35 years, PR: 0.71; 95% CI: 0.50-1.00), rural residence (PR: 0.64; 95% CI: 0.35-1.16), menstrual irregularity (PR: 0.80, 95% CI: 0.54-1.18), and shift work (PR: 0.83; 95% CI: 0.56-1.23). There were no strong predictors in agreement among males.

Conclusion: Self-reported and wearable-measured sleep duration showed poor agreement in a preconception cohort. Age, rurality, menstrual irregularity, and shift work predicted poor agreement in short sleep duration among females.

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0752

REGIONAL CEREBROVASCULAR PATHOLOGY IS ASSOCIATED WITH LOCAL DISRUPTIONS IN NON-RAPID EYE MOVEMENT SLEEP EXPRESSION

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Introduction: Aging is associated with disruptions in non-rapid eye movement (NREM) sleep expression, but the mechanisms driving this effect remain unclear. Cerebral small vessel disease (CSVD) burden increases with age and is associated with clinical sleep disturbance, but little is known about its relationship with local expression of oscillatory activity during NREM sleep. Here, we explore associations between CSVD burden and local electroencephalography (EEG) measures during NREM sleep in older adults.

Methods: Fifteen cognitively intact older adults (mean age 71.8±6.3 years, 10 female, Apnea Hypopnea Index (AHI)=7.82±7.95) completed T2-weighted fluid-attenuated inversion recovery magnetic resonance imaging on a 3T scanner to quantify total and lobar white matter hyperintensity (WMH) volumes using a validated semi-automated toolbox and an in-lab overnight polysomnography with 128-channel EEG, separated by 1.95±1.02 years. EEG was preprocessed and multi-tapered to derive absolute spectral power. Topographical correlations between NREM multi-tapered absolute spectra bands were run with 5000-permutation threshold free cluster enhancement.

Results: Older age was associated with lower absolute posterior total (all $p < 0.016$, $r > -0.61$) and slow sigma power (all $p < 0.018$, $r > -0.60$) and slow wave activity (SWA) (all $p < 0.017$, $r > -0.61$) over centro-posterior EEG derivations. Age was also positively associated with frontal ($\tau = 0.51$, $p < 0.01$) and parietal ($\tau = 0.49$, $p < 0.01$) but not occipital ($\tau = 0.33$, $p = 0.092$) or temporal ($\tau = 0.36$, $p = 0.064$) WMH burden. Occipital WMH burden was also not associated with AHI ($\tau = 0.038$, $p = 0.843$). Occipital WMH burden was associated with global reductions in alpha activity (all $p < 0.043$, $\tau > -0.78$), centro-posterior reductions in SWA (all $p < 0.043$, $\tau > -0.63$) and Delta (all $p < 0.009$, $\tau > -0.63$), frontal reductions in total (all $p < 0.043$, $\tau > -0.71$) and fast sigma power (all $p < 0.004$, $\tau > -0.57$), global reductions in slow sigma power (all $p < 0.043$, $\tau > -0.71$), and central reductions in theta activity (all $p < 0.042$, $\tau > -0.57$).

Conclusion: Collectively, these findings indicate that WMH burden in older adults is associated with local disruptions in NREM sleep expression in multiple frequency bands associated with sleep-dependent cognitive functions. Future studies should examine the role of NREM sleep expression in cognitive decline associated with CSVD burden.

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0753

RELATIONSHIP BETWEEN OSA AND SLEEP BIOMARKER BASED NEURODEGENERATIVE DISORDER RISK IN A CLINICAL COHORT

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Introduction: In this pilot study, sleep biomarker-based neurodegenerative disorder (NDD) risk was assessed in a clinical cohort of patients diagnosed with varying severity of obstructive sleep apnea (OSA).

Methods: Consecutive in-home multi-night Sleep Profiler records from a community sleep clinic were screened for age >54 years old. Cases with comorbid restless leg syndrome, hypersomnia, missing apnea-hypopnea indexes (AHI), AHI< 5 or single-night recordings were excluded. The 67 remaining records were 40% female, ages 63 + 7.4 years and up to 84 years old. NDD risk was assigned using a machine-learning algorithm combining age and nine sleep biomarkers to assign group probabilities: for Alzheimer's disease, Lewy Body disease, prodromal synucleinopathy and controls (CG). Sleep biomarkers included: time-REM, non-REM hypertonia, autonomic-activation index, spindle-duration, atypical-N3, time-supine, sleep-efficiency, relative-theta, and theta/alpha. Those with CG probability score >70% were classified as "Probably-normal". Those with CG probability between 45 - 70% were classified as "Likely-normal". Insomnia severity >14 and a PHQ 9 > 5 were used as cutoffs for clinical insomnia and depression. Mann-Whitney U-tests were used to evaluate group differences.
Results: This cohort had 37% mild, 34% moderate, and 29% severe OSA. Self-reported comorbid insomnia and depression were present in 43%. Seventy-three percent of patients were classified as "Probably-normal", 16% "Likely-normal", 11% "Likely-NDD" or "Probable-NDD". The "Probably-normal" group was younger than the rest of the cohort (62 + 6.2 years vs. 68 + 8.6 years, p< 0.01). Of those classified as "Probably-normal" (n=49), OSA was mild in 16, moderate in 17 and severe in 16. Mean AHI trended higher in the "Probably-normal" group than in those with elevated NDD risk (29 + 23.9 vs. 19 + 13.6 events/h, p=0.085).
Conclusion: Approximately 89% of the clinical cohort was classified as "Probably-normal" or "Likely-normal". NDD risk was age-dependent. Interactions between OSA severity and NDD risk were not apparent in these findings, possibly related to group-wide effects. NDD risk, as measured by this model, did not appear to be adversely biased by untreated OSA. These results suggest a need for longitudinal studies to compare NDD risk in untreated OSA versus controls without sleep disordered breathing.
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0754

SLEEP SIGHTLINES AND SOUNDWAVES: EXPLORING SEX DIFFERENCES IN SLEEP-RELATED ATTENTIONAL BIAS IN OLDER ADULTS

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Introduction: Insomnia disorder affects 12-20% of older adults, with 2x higher prevalence in women than men. Persistent insomnia symptoms may be influenced by excessive sleep preoccupation and biases toward sleep-related stimuli ("sleep-related attentional bias"). Whether this bias is sex- and/or modality-specific remains unexplored. This study examined whether there are sex differences in visual/auditory sleep-related attentional bias in older adults.
Methods: Older adults (Mage=68.2±5.9) with (n=31; Women:20/Men:11) and without (n=50; Women:28/Men:22) insomnia (DSM-5 criteria plus reported 6+nights/14 of >30 mins sleep onset latency or wake after sleep onset) completed modified Posner Cueing tasks. Cues included sleep-related auditory (e.g., alarms, snoring), visual (e.g., clocks set to bedtimes, person awake in bed) and non-sleep (auditory: pure tones; visual: neutral International Affective Picture system images) stimuli. Valid [non-cued reaction time (RT) minus validly-cued RT] and invalid (non-cued RT minus invalidly-cued RT) sleep/non-sleep visual/auditory cueing effects were calculated. Two-way ANOVAs examined whether insomnia status interacts with sex it its impact on mean cueing effects.
Results: For visual valid (F=4.39, p=.039) and invalid (F=4.78, p=.03) sleep-related cueing effects, there were significant interactions between insomnia status and sex. Pairwise comparisons revealed insomnia men had larger (trending/p=.06) valid sleep-related cueing effects (122.0±20.0ms) than non-insomnia men (71.0±10.0ms). Invalid sleep-related cueing effects for insomnia men (123.0±23.0ms) were larger (p=.02) than insomnia women (56.0±16.0ms) and larger (p=.02) than non-insomnia men (57.0±15.0ms). For auditory valid cueing effects, there were main effects of insomnia status for sleep-related (F=4.39, p=.04) and non-sleep-related (F=6.32, p=.003) stimuli. Larger effects were observed in insomnia for valid sleep-related cues (insomnia:145.0±18.0ms; non-insomnia:89.0±12.0ms; p=.009) and valid non-sleep-related cues (insomnia:152.0±19.0ms; non-insomnia:81.0±13.0ms; p=.003) cues.
Conclusion: Visual sleep-related attention bias in older adults with insomnia may be sex-dependent, with men more likely to experience this phenomenon. Possible underlying sex-specific mechanisms include contributions of circulating testosterone to spatial attention and sleep-stimuli valence and/or threat detection. Visual stimulus desensitization towards insomnia triggers may be particularly beneficial in older men to facilitate sleep. Auditory attentional bias in insomnia may not be sex-dependent and reflect general auditory cortex hypervigilance.
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0755

SLEEP STRATEGIES AND SLEEP-RELATED ADVERSE EVENTS EXPERIENCED BY RUNNERS IN 200-MILE ULTRAMARATHONS

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Introduction: Sufficient sleep is essential for the athletic recovery process and is considered foundational for optimal sports performance. Participation in ultramarathons taking place over multiple days may benefit from specific sleep strategies to avoid sleep-related adverse events and injury. This study aimed to identify if and which types of sleep strategies were used by ultramarathon runners, whether these were associated with sleep-related adverse events or injury, and the types of sleep-related adverse events experienced during these races.
Methods: This cross-sectional study comprised an electronic survey distributed to ultramarathoners aged 18 years or above who had recently completed a 200-plus mile race. Survey distribution was facilitated by race directors between June and

September 2023. The survey included questions about demographics, ultramarathon experience, training habits, sleep-related factors, sleep-related adverse events experienced during the race, and whether an injury was sustained. Continuous variables were summarized as mean (standard deviation) and categorical variables as N (%). Logistic regression was used to quantify associations between sleep strategies and sleep-related adverse events and injury.

Results: Of 115 survey respondents who competed in a 200-plus mile ultramarathon, mean (standard deviation) age was 47.5 (10.8) and 67.0% were men. Among 71 respondents (61.7%) who reported using a sleep strategy during the race, the most common was 'sleeping when exhausted' (N=31; 43.7%) and the least common was sleeping for 6-8 hours (N=3; 4.2%). Using a strategy of 'sleeping when exhausted' was significantly associated with having a sleep-related adverse event (odds ratio 3.5, 95% confidence interval 1.3-9.5, p=0.01) but was not associated with sustaining an injury during the race (odds ratio 0.7, 95% confidence interval 0.2-2.1, p=0.5). Of 42 people who reported experiencing a sleep-related adverse event, the most common was experiencing hallucinations (N=40; 95.2%).

Conclusion: Sleeping when exhausted during an ultramarathon was a common strategy associated with experiencing hallucinations during the race. Further investigation should determine whether this is perceived as problematic for runners or if this is an integral part of their ultramarathon experience. Longitudinal research into acute, sub-acute and chronic downstream sequalae of sleep deprivation in this athletic population is warranted.

Support (if any):

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0756

VALIDITY OF SELF-REPORTED SLEEP IN THE CANCER PREVENTION STUDY – 3

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Introduction: Self-reported sleep measures are widely used in epidemiology research and may be influenced by a variety of factors, potentially introducing measurement error. We examined the one-year test/re-test concordance and validity of survey-assessed sleep duration.

Methods: The Activity Validation Sub Study (AVSS) included 751 participants of the Cancer Prevention Study-3 study to further investigate rest/activity cycles. Sleep duration was collected using three methods: survey, Daysimeter device, and sleep diary. Survey-assessed sleep duration was collected in categorical and continuous formats. Selected participants (n=170) were asked to wear a device for seven consecutive days for two non-consecutive quarters and recorded sleep duration in sleep diaries for each night. Of the 170 study participants assigned a device, participants were excluded from the current study due to incomplete AVSS survey data, implausible device data, reported working night shift, insufficient days of device wear or diary entries, or reported less than 3 hours or greater than 14 hours of sleep for any of the sleep measures. We calculated concordance of pre- and post-survey sleep duration for both survey question using Spearman correlation. We used the method of triads to estimate the validity coefficient (VC) between the three sleep duration measurements in the present study and the "true" latent sleep duration measure, and bootstrapped 95% confidence intervals (95% CI). This was done for both survey-assessed sleep duration measures.

Results: A total of 117 participants were included in the study (53% male). Test-retest correlation for the pre- and post-survey showed strong and moderate correlations for sleep duration collected continuously and categorically, respectively. The VC for survey-assessed continuous sleep duration and the latent sleep duration was 0.83 (95% CI 0.72, 0.90) for weekday and 0.62 (95% CI 0.42, 0.78) for weekend. Performance of the VC was slightly weaker for survey-assessed categorical sleep duration (weekday VC=0.60 95% CI 0.45, 0.73; weekend VC=0.44 95% CI 0.29,0.61).

Conclusion: Performance of survey-assessed sleep duration as compared to device and diary measures varies based on how the question is asked and/or the response structure.

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0757

ASSOCIATION OF INSOMNIA WITH OBJECTIVE SHORT SLEEP DURATION AND OTHER PHENOTYPES WITH MORTALITY IN OLDER PERSONS

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Introduction: The association of insomnia with objective short sleep duration (ISSD) and mortality has not been studied in older persons.

Methods: In 3,601 men from the Osteoporotic Fractures in Men Sleep Study (average age 76±6 years) and 3,295 women from the Study of Osteoporotic Fractures (average age 84±4 years), we used Cox proportional hazards models to examine the association of ISSD (trouble getting to sleep within 30 minutes, waking up in the middle of the night or early morning, and/or taking a medication to help with sleep ≥3 times/week and actigraphy-estimated sleep duration< 6h) with mortality. We also examined whether other sleep phenotypes (insomnia with normal sleep duration [INSD; insomnia and sleep duration 6-9h], asymptomatic short sleep [AS; no insomnia and sleep duration< 6h], long sleep [LS; self-reported or actigraphic sleep duration>9h]) were associated with mortality. Persons with normal sleep (no insomnia and actigraphic sleep duration 6-9h) served as the reference group. Follow-up times were 6,538 and 2,953 days in men and women, respectively. Adjusted models included age, race, education, obesity, depression, diabetes, COPD, stroke, hypertension, myocardial infarction, and heart failure. In analyses for men, we also adjusted for severe sleep disordered breathing (apnea-hypopnea index >=30).

Results: Prevalence rates in men/women for ISSD, INSD, AS, and LS were 19.9%/11.5%, 41%/34.8%, 10.6%/10.4%, and 7.7%/17.9%, respectively. Mortality rates for men and women were 65.2% and 35.7%. Compared to men with normal sleep, ISSD (OR 1.32 [1.16, 1.52]) and LS (OR 2.22 [1.58, 3.12]) in men were associated with increased mortality risk in unadjusted

models. In adjusted models, only LS vs. normal sleep conferred higher mortality risk (adjOR 1.49 [1.03, 2.14]). Similarly, ISSD (OR 1.32 [1.07, 1.62]) and LS (OR 4.65 [3.49, 6.19]) in women were associated with increased mortality risk in unadjusted analyses, but only women with LS had a higher mortality risk in adjusted models (adjOR 2.30 [1.60, 3.31]). Compared to normal sleepers, neither INSD nor AS in older men or women were related to mortality risk.
Conclusion: ISSD and LS represent high risk phenotypes in older persons. Future work should examine causal pathways and determine whether sleep improvements decrease mortality risk.
Support (if any): AASM Foundation, NIA

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0758

ASSOCIATIONS BETWEEN ACTIGRAPHY-ASSESSED STEP ACTIVITY AND SLEEP IN OLDER ADULTS FOLLOWING ACUTE HOSPITALIZATION

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Introduction: Three out of 10 older adults are admitted for acute care in U.S. hospitals where they are at risk for a rapid decline in physical function due to deconditioning. Clarifying the relationship between sleep and the recovery of physical functioning is a key step in facilitating independence following hospital discharge. Thus, this study aimed to examine the association between step activity and sleep parameters after an acute hospitalization in community dwelling older adults.
Methods: Patients (n=52; age 71.3 ± 6.8y, 75% female, 94.2% white), were recruited during an acute hospitalization. Participants completed sleep questionnaires including PROMIS Sleep-Related Impairment and Sleep Disturbance during acute hospitalization (baseline) and at 4-weeks post-discharge (follow-up). Participants were also given an ankle-worn accelerometer (Modus Stepwatch®) to continuously record the steps and active minutes in the hospital and the 4-week period following discharge. A subset of participants (n=26) also received an actigraphy device (Philips Actiwatch-2®) to measure number of awakenings and wake after sleep onset (WASO). Separate multivariate regression analyses were performed to determine whether steps activity predicted sleep parameters.
Results: An increase in active minutes was inversely associated with number of awakenings (-0.09±0.04, p=0.04), although the association with WASO was not significant. The average number of active minutes was inversely associated with PROMIS Sleep Disturbance score at follow-up (-0.12±0.06, p=0.04) and change in PROMIS Sleep-Related Impairment score (-0.12±0.05, p=0.03) from baseline to follow-up.
Conclusion: Together, these results demonstrated that increase in the number of minutes when steps are taken following hospitalization decreased the number of awakenings, sleep disturbance and sleep-related impairment.
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0759

INSOMNIA WITH REDUCED SLEEP IS A RISK FACTOR FOR GLOBAL COGNITIVE DECLINE IN COGNITIVELY UNIMPAIRED OLDER ADULTS

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Introduction: Meta-analytic studies support that insomnia is a risk factor for cognitive decline and dementia, but limited accounting of confounders reduces their validity. Further, it is unclear whether these associations are driven by specific insomnia phenotypes. In this study, we aimed to assess the relationship between insomnia and longitudinal global cognitive decline in community-dwelling older adults after considering self-reported sleep duration changes and other important characteristics.
Methods: From the Mayo Clinic Study of Aging (MCSA) cohort, we identified all (age>=50yo) cognitively unimpaired participants at baseline without comorbid neurological disease with at least two previous comprehensive neuropsychological evaluations. Participants with at least two occurrences of insomnia ICD diagnosis (by EMR and Rochester Epidemiological Project data) at least 30 days apart were classified as having insomnia, and those without any instance of diagnosis were considered negative for insomnia. Changes in sleep duration were assessed using the question #16 of BDI-2 and categorized in reduced sleep (yes/no). We fit mixed-effect regression models to assess whether insomnia was associated with standardized global cognitive scores, after adjusting for age, sex, education, APOEe4, composite cardiovascular and metabolic conditions scores, anxiety/depression, reduced sleep, OSA (ICD diagnosis), alcoholism (CAGE≥2), and pain (NSAIDs use). Number of cognitive assessments and time from baseline were included as both fixed and random effects. Multiple interactions (e.g. insomnia*reduced sleep) were included. A backward stepwise procedure maintaining the hierarchical principal for interactions was utilized to reach the most parsimonious models.
Results: 3063 participants (50.24% males, aged 70±9.73 at baseline) were included. Insomnia alone was not associated with a decrease in global cognition, but when combined with subjective reduction in sleep duration at baseline it was associated with a -0.19 (95% CI: -0.32, -0.07; interaction p=0.01) reduction in global cognitive scores. This was equivalent to approximately 3 additional years of age or 6 cardiometabolic comorbidities at baseline. The effect size was greater than those associated with

baseline cognition for having any APOE e4 allele (-0.12) and alcoholism (-0.15).
Conclusion: Insomnia with reduced sleep duration phenotype is a potentially modifiable risk factor for cognitive decline in older adults. Further studies with objective sleep measures are necessary for objective confirmation.
Support (if any): NIA/NIH

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0760
SLEEP HEALTH PROFILES ACROSS SIX HARMONIZED COHORTS AND THEIR ASSOCIATION WITH FUTURE DEPRESSIVE SYMPTOMS

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Introduction: Depression is a leading cause of disability in older adults, yet it remains underdiagnosed and undertreated. Establishing common multivariable sleep health profiles may eventually help to identify at-risk older adults and match them with appropriate treatments. However, profiles identified across cohorts often differ because of inconsistent measures and methods, hampering progress towards large-scale initiatives. We aimed to overcome this challenge using harmonized data across six cohorts.
Methods: We harmonized five self-report sleep health indicators across six epidemiologic cohorts of adults aged >60 from the United States and Netherlands (N=613 - 3,123). We performed latent class analysis in each cohort. Generalizability and comparability of findings were assessed using several indices, including cluster stability and novel distance metrics. Generalized linear mixed-effects modeling was used to relate sleep health profiles to the risk of increased depressive symptoms over time in each cohort.
Results: Two sleep health profiles were common across all cohorts: 'Good Sleep' (GS; average sleep duration, high quality and efficiency) and 'Poor Sleep' (PS; short sleep duration, low quality and efficiency, high daytime sleepiness). Three cohorts indicated an 'Inefficient Sleep' profile (IS) and three cohorts indicated a 'Long Sleep' profile (LS). PS had high and sustained depressive symptoms over 3-15 years of follow-up, especially relative to GS and IS (Risk Ratios [RRs]=1.47-3.44 for PS vs.GS; 1.75-2.32 for PS vs. IS; and 1.10-1.15 for PS vs. LS).
Conclusion: GS and PS profiles were generalizable across cohorts. Older adults with the PS profile had heightened depressive symptoms over multiple years of follow-up, especially relative to GS and IS profiles. Next steps involve quantifying the impact of screening using sleep health profiles and gathering evidence that interventions targeting sleep health profiles reduce onset or severity of depression.
Support (if any): Wallace (RF1AG056331); Rush Alzheimer's Disease Center (R01AG017917, R01AG022018); Osteoporotic Fractures in Men Study (U01AG027810, U01AG042124, U01AG042139, U01AG042140, U01AG042143, U01AG042145, U01AG042168, U01AR066160, UL1TR000128, R01HL071194, R01HL070848, R01HL070847, R01HL070842, R01HL070841, R01HL070837, R01HL070838, R01HL070839); Study of Osteoporotic Fractures (R01AG005407, R01AR35582, R01AR35583, R01AR35584, R01AG005394, R01AG027574, R01AG027576, and R01AG026720); Rotterdam Study (Erasmus Medical Center and Erasmus University, Netherlands Organization for the Health Research and Development, Ministries of Education and Health, European Commission, Rotterdam Municipality).

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0761
THE INFLUENCE OF SEX ON SLEEP CHARACTERISTICS IN THE OLDER ADULT POPULATION: FINDINGS FROM THE EPISONO SLEEP STUDY

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Introduction: Sleep plays an important role in the prevention and development of several chronic diseases. However, there are significant differences between female and male sleep characteristics, some of which can be lifelong. Thus, the objective of this study was to analyze, according to sex, the polysomnographic findings of adults and older adults who participated in 2 editions (2007 and 2015) of EPISONO, an ongoing Brazilian, population-based sleep study.
Methods: The baseline randomized sample included 1,042 volunteers in 2007, of these 688 were reassessed in 2015. There were 574 women and 468 men in 2007, and 380 women and 308 men in 2015. All examinations and tests were undertaken using the same protocols at both times. All participants completed an institutional questionnaire to collect socioeconomic data, and a range of other questionnaires on health and sleep parameters, and underwent full-night polysomnography (PSG) and peripheral blood collection for biochemical and hematological measurements. In both editions (2007 and 2015) physical and anthropometric assessments were made. The exclusion criteria were: pregnant and nursing women, individuals with self-care limitations (physical or mental), and shift workers.
Results: We observed that adult (p=0.003) and older adult women(p=0.001) spent more time in N3 than men, with a greater number of awakenings (p=0.001), and an increased periodic leg movement index in older adult women (0.012), but only adult women in the follow-up presented greater sleep efficiency (p=0.047). Men (adults and older adults) remained longer in N1 and adult men (p=0.001) had a higher apnea-hypopnea index (p=0.001).
Conclusion: This study prospectively evaluated with full-night PSG the sleep of the general population and reported significant findings according to sex and age, suggesting that some aspects of sleep change differ with age and according to sex.
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0762

ASSESSING SLEEP HEALTH LITERACY IN OLDER ADULTS: DYSFUNCTIONAL BELIEFS ABOUT NAPPING

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Introduction: Many older adults have false, or inaccurate beliefs about sleep and insomnia that lead them to adopt coping strategies that are frequently counter-productive. People who are sleep-deprived frequently take naps to compensate for fatigue, and 'power naps' are frequently recommended for stress reduction. Research has shown some correlations between older adults' napping habits and increased medical comorbidities and risks of dementia, but it has also shown that napping enhances memory consolidation and broader aspects of cognition in younger adults. Guidance against napping has centered around the possibility of detrimental effects on nighttime sleep duration and quality, and/or possible links to cognitive impairment. But much previous research has neglected to differentiate between daytime sleepiness, a complex phenomenon associated with medical comorbidities, and to regulate nap timing and duration. With greater sleep-oriented health literacy, older adults, their families, and caregivers could overcome many of these dysfunctional beliefs and learn to use intentional napping as effective compensation for a poor night's sleep.
Methods: Semi-structured, audio-recorded interviews were conducted with residents of 2 senior living communities in the Midwest who self-reported sleep problems. The interviews were supplemented by self-report instruments, including the PSQI, along with the Dysfunctional Beliefs About Sleep Scale (DBAS) and a questionnaire about napping and daytime sleep. In the second phase, a subset of participants took part in a sleep health literacy educational intervention, in which they practiced intentional napping under recommended guidelines.
Results: Insomnia symptoms ranged from 6 months - 20+ years in duration. Mean PSQI score = 9 (5+ is considered indicative of sleep problem). 5 participants reported napping in qualitative interviews but denied daytime sleep on standard sleep assessments. Others expressed dread of napping because of perceived links to functional and cognitive decline.
Conclusion: Participants expressed optimism and relief upon learning that napping could be beneficial to their sleep.More research is needed into the ways napping can improve physical and cognitive function, and more education is needed for older adults, their families and caregivers, and long-term care staff about the importance of sleep for older adults.
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0763

ASSOCIATION OF CHRONOTYPE AND SLEEP CHARACTERISTICS WITH OBESITY INDEXES IN KOREAN ADULTS

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Introduction: Insufficient sleep and circadian disruption are known modifiable risk factors for obesity. Chronotype reflects an individual's preferences in sleep timing and behaviors. This study examined the association between sleep characteristics and common obesity indicators, body mass index (BMI) and waist circumference (WC), according to chronotype in Korean adults.
Methods: This study used data from the Korean Medicine Daejeon Citizen Cohort study of 2,000 participants in their 30s to 50s from 2017 to 2019. The survey examined several sociodemographic and lifestyle factors. Sleep characteristics including time, quality, latency, and efficiency were investigated using the Pittsburgh Sleep Quality Index questionnaire. Chronotype was classified into morning (M), evening (E), and intermediate types based on single nucleotide polymorphisms in insomnia-related genes such as SYCE1L, IP6K3, PLCL1, APOE, and DPP3. Anthropometric measurements of BMI and WC were performed to assess obesity indices. General linear model adjusted for sex and age was performed to determine association between sleep and obesity index according to morning and evening types.
Results: Among the total 2,000 participants, the chronotype distribution was 5.3% morning type, 9.5% evening type, and 85.2% intermediate type. The evening type tended to have shorter sleep time (M: 6.75, E: 6.66 hr), poor sleep quality (M: 4.55, E: 4.68 score), longer sleep latency (M 19.7, E: 22.5 min), and low sleep efficiency(M: 95.1, E: 94.7%) than the morning type, but there was no statistically significant difference. The WC and BMI of the morning and evening types were similar. Morning type was associated with long sleep latency and increased WC (B= 0.12, 95% CI= 0.01 – 0.22, p=0.01). However, there was no association between them in the evening type. Additionally, morning types, being married and having less physical activity were associated with increased WC. Male was associated with increased WC and BMI, regardless of morning and evening types.
Conclusion: This study has demonstrated that the associations between sleep status and obesity indicators may vary in Korean middle-aged adults depending on chronotype, especially morning type. Future study will be needed on the causality between obesity considering chronotype, sleep status, and general characteristics.
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0764

CLINICAL PHENOTYPES OF PATIENTS WITH OBSTRUCTIVE SLEEP APNOEA: A RETROSPECTIVE STUDY

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Introduction: The various clinical manifestations of Obstructive Sleep Apnoea (OSA) have not been officially depicted in clinical practise. The lack of clinical knowledge on the heterogeneity of OSA may present fundamental difficulties in its clinical recognition, resulting in missed conclusions for diagnosis. OSA symptoms frequently include higher airway narrowing, excessive sleepiness, sleep disturbances, and general fatigue. It is well known that the aetiology, symptoms, and consequences of OSA vary between patients.
Methods: Retrospective chart review of all patients who were evaluated at SMRC from 2017 to 2022. Data about patients' demographics, chief complaint (Excessive day time sleepiness (EDS), Insomnia, Co- morbidities with no symptoms), chronic diseases, STOP-Bang risk, CPAP adherence and values of ESS,

RLS, ODI and AHI. The CPAP adherence was defined as using CPAP < 4 hours per day at least for 5 nights per week or ≥ 70% of all recorded days.
Results: shows that participants whose chief complaint was EDS had a significant higher mean BMI, higher ESS value and a significant higher percent of having a high-risk STOP-Bang (p=< 0.05). Participants whose chief complaint was insomnia had a significant older age (p=< 0.05). While those patients had a significant lower BMI, lower ESS and lower ODI levels (p=< 0.05). Participants whose chief complaint was referral from other services due to co- morbidities with no symptoms had a significant younger age and a significant lower value of ESS (p=< 0.05). participants with poor CPAP adherence had a significant older age, higher BMI, and higher ESS (p=< 0.05).
Conclusion: Different OSA phenotypes have different characteristics . Clustering OSA patients may lead to more individualized therapy with better compliance.
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0765

COMPARATIVE ANALYSIS OF SLEEP MEASUREMENT METHODS: PSG VS. ACTIGRAPHY IN COGNITIVELY NORMAL ELDERLY PATIENTS

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Introduction: Polysomnography (PSG) is the gold standard for sleep measurements, requiring individuals to sleep in a controlled environment. In contrast, actigraphy is more naturalistic, allowing at-home monitoring. While most studies comparing actigraphy to PSG have focused on healthy adults and individuals with sleep disorders, there has been limited research involving a well-characterized, healthy older adult population. Although actigraphy is convenient, it has been noted to differ from PSG in some aspects. Our study aims to assess the correlation between PSG and actigraphy in cognitively healthy older adults participating in NYU research on sleep, aging, and memory.
Methods: PSG recordings were conducted overnight at the bedside, while wrist-based data were collected on separate nights from individuals' homes. Actigraphs were worn on the non-dominant hand for seven consecutive days, validated by sleep logs. Statistical analyses, including t-tests, chi-square tests, and sensitivity-specificity assessments, were performed.
Results: Of the 151 subjects, 97 (64.2%) were female, 54 (35.8%) were male, 43 (28.5%) were Black/African American, and 108 (71.5%) were White. Mean age was 66 years (61-71). Mean Epworth Sleepiness Score was 5 (3-8) for women and 6 (3-9) for men. Total sleep time for PSG was 376 (332-418) with a mean difference with actigraphy of -67.4, 26, and 121 minutes (minimum, median, and maximum thresholds respectively, p< 0.0001 for all) Sleep efficiency (%) was higher in the actigraphy group (mean difference 11.2 [SD12.7]) and sleep latency was shorter in the actigraphy group (p< 0.001 for all). Sensitivity for short sleepers(< 5h) was 0.7, increasing to 0.9 in females and 0.86 in Black or African Americans. Specificity corresponded to 0.95, decreasing to 0.87 in males, and to 0.48 in whites, while increasing to 0.96 in black patients. Both sensitivity and specificity for long-sleepers(< 9h) corresponded to 0.5. Positive predictive value for short sleepers was 0.9, and 0.76 for long sleepers.
Conclusion: Overall, the study highlights the complexity of sleep measurements and the potential impact of conducting PSG and actigraphy on different nights. It underscores the need to consider nightly variability in sleep studies, the different diagnostic methods used, and the influence of sex and ethnicity on sleep patterns.
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0766

CURRENT SLEEP HYGIENE STATUS IN NON-CLINICAL POPULATION IN KOREA

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Introduction: This study examines the difference in sleep hygiene status according to age and sex and the relationship between sleep hygiene and insomnia in the non-clinical Korean population using the Sleep Hygiene Practice Scale in Korean (SHPS-K), validated through this study.
Methods: We recruited non-clinical adults (Aged 18-65) without a history of neurologic, psychiatric, or medical disorders and diagnosed sleep disorders. An online survey was done using SHPS-K, the Pittsburgh Sleep Quality Index (PSQI-K), Insomnia Severity Index (ISI-K), and Epworth Sleepiness Scale (KESS). The first survey enrolled 484 participants (242 women, mean age of 43.8 years), among whom 322 completed the second survey. SHPS-K was compared between each age group, sex, and group with or without insomnia symptoms (ISIS-K 15). Using receiver operating characteristic analysis in different age groups, we also determined the cutoff values that could identify poor sleepers with insomnia symptoms (PSQI-K > 5 and ISI-K 15).
Results: The average total SHPS-K score was 71.2, with no sex difference. Mean ISI-K, PSQI, and ESS were not different between sex and age groups. The older participants had lower SHPS-K than the younger groups, with a significant trend for ages (=-3.01, p< 0.001). This trend was significant in both men and women. Men had poorer eating and drinking behaviors among the four domains, and women had poorer sleep scheduling and timing behaviors. Young adults with insomnia symptoms showed the highest SHPS-K than other age groups with insomnia (p < 0.001). A cutoff value of 76, 74, and 66 identified poor sleepers with insomnia (area under the curve = 0.818, 0.837, 0.849) in young, middle-aged, and older adults, respectively.
Conclusion: This study showed that sleep-disturbing behaviors were different between age groups and sex. The group with insomnia symptoms showed worse sleep hygiene practices. Furthermore, young adults had significantly worse sleep hygiene than middle-aged or older adults. Sleep hygiene education could contribute differentially to improving sleep quality in non-clinical populations.
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0767

ICSD-3 TR CRITERIA FOR NOCTURIA: IS 3+ NIGHTLY EPISODES TOO HIGH A BAR?

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Introduction: Prior studies suggest that nocturia negatively affects sleep quality and daytime function. In the new ICSD-3 TR, nocturia is defined as three or more nightly episodes of urination arising from sleep. Previous studies suggest that two or more nightly episodes are bothersome and clinically meaningful. This study investigated the relationship between frequency of nocturia and symptoms of reported bother and sleep disturbance in a sample of middle-aged and older adults using hypnotics.
Methods: We performed secondary analysis of baseline assessment data collected for a multi-site trial testing hypnotic deprescribing programs. Participants aged >=55 years who use hypnotics completed self-reported assessments of nighttime urination frequency, bother from nocturia (not at all [0] to a lot [3]), and sleep outcomes (Pittsburgh Sleep Quality Index [PSQI], Insomnia Severity Index [ISI], and Epworth Sleepiness Scale [ESS]). Adjusting for age, gender, and site, we regressed each outcome on nocturia frequency (one vs 0, two vs 0, three vs 0, four+ vs 0 episodes) and estimated differences in adjusted means.
Results: Among participants (n=335;72% male, 76% white, mean age 68.9 years, 21% diabetes, 26% enlarged prostate, 48% depression), the estimated differences (#nightly urination episodes versus 0 episodes) in adjusted means for each outcome were: bother (one episode of nocturia: 0.77, two: 1.07, three: 2.08, four+: 2.02; all P<.001), worse PSQI (two: 1.64, three: 2.61, four+: 3.14; all P<.05; one episode was not significant [NS]), and worse ISI (three: 3.38, four+: 5.36, all P< .01; one, two episodes were NS). Only four+ episodes were associated with a difference in mean ESS (2.71, p<.05).
Conclusion: As episodes of nocturia increased, bother from nighttime urination and sleep disturbance increased. When compared to zero nocturia episodes, nocturia at a threshold of two or more nightly episodes was associated with more bother and worse overall sleep quality. Only insomnia severity worsened at a threshold of 3 nightly episodes. These findings may not apply to women and minority populations, who were underrepresented. A nocturia frequency threshold requiring 3 or more nightly episodes may miss individuals suffering from significant adverse effects of nocturia on their overall sleep quality.
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0768

POOR SLEEP QUALITY INCREASES MORTALITY RISK. A POPULATION-BASED LONGITUDINAL PROSPECTIVE STUDY IN ADULTS

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Introduction: Sleep-related symptoms have been associated with adverse health outcomes, including increased mortality risk. Studies that analyzed the correlation between sleep and mortality focused on the single effect of self-reported sleep duration or relied on nonstructured questionnaires about sleep. In order to evaluate the detrimental effects of sleep disorders, studies should be based on well-structured and validated questionnaires that inquire about different components of sleep, including sleep quality. In addition, taking into consideration the fluctuations in sleep duration over the study period is essential. We aimed to assess the association between sleep quality and all-cause mortality in community-dwelling adults living in rural Ecuador.
Methods: Individuals aged ≥40 years enrolled in the prospective population-based Three Villages Study cohort were included. Sleep quality was assessed by means of the Pittsburgh Sleep Quality Index (PSQI). Study participants were evaluated at baseline and at every annual door-to-door survey until they remained enrolled in the study. Mixed models Poisson regression for repeated PSQI determinations and multivariate Cox-proportional hazards models were fitted to estimate mortality risk according to sleep quality.
Results: Analysis included 1494 individuals (mean age: 56.6 ± 12.5 years; 56% women) followed for a median of 6.3 ± 3.3 years. At baseline, 978 (65%) individuals had good sleep quality and 516 (35%) had poor sleep quality. The effects of PSQI scores changing over time on mortality was confounded by the impact of the SARS-CoV-2 pandemic on both. One hundred ninety-five individuals (13%) died during the follow-up, resulting in a crude mortality rate of 1.58 per 100 person years (95% C.I.: 1.27-1.88) for individuals with good sleep quality, and 3.18 (95% C.I.: 2.53-3.82) for those with poor sleep quality at baseline. A multivariate Cox-proportional hazards model showed that individuals with poor sleep quality at baseline were 1.38 times (95% C.I.: 1.02-1.85) more likely to die compared to those with good sleep quality; in this model, increased age, poor physical activity, and high fasting glucose remained significant.
Conclusion: Poor sleep quality is associated with increase mortality risk among middle-aged and older adults.
Support (if any):

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0769

SLEEP QUALITY IN MIDLIFE IS ASSOCIATED WITH MOBILITY AND BALANCE IN LATER LIFE IN THE WISCONSIN SLEEP COHORT

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Introduction: Cross-sectional studies suggest that poor sleep quality predicts worse performance on tests of mobility in older persons; however, little is known about how objectively-assessed sleep quality in midlife is associated with declines in mobility and balance later in life. We examined the association of three objectively-assessed sleep quality measures in midlife adults as predictors of measures of mobility and balance assessed, on average, 8 years later in participants of the Wisconsin Sleep Cohort study.

Methods: Wisconsin Sleep Cohort participants (n=576, 47% female) had sleep (in-laboratory polysomnography) studies to assess sleep quality at midlife and, on average 8 years later, Timed Up and Go (TUG) tests to assess mobility and balance. There were some participants with repeat visits (n=378) yielding a total data set of 945 data points. Mean age (SD) at the baseline sleep study visits was 61(8) years. Sleep quality variables include percent N3 and percent REM sleep and sleep efficiency. The Timed Up and GO (TUG) test measures time in seconds to complete a walking task with 4 different variations: walking only, walking with an obstacle at midpoint, walking while counting backwards by 3's, and walking with both an obstacle and while counting backwards by 3's. Models were adjusted for age, sex, body mass index, total sleep time, and self-reported habitual sleep time. PROC MIXED in SAS was used to account for repeated measures.
Results: Less percent N3 sleep at baseline was significantly associated with reduced performance (greater time to complete) on 3 of the 4 variations of the TUG test, performed on average, 8 years after sleep assessment (all $p < 0.05$ in adjusted models). A similar pattern of associations was observed with REM and sleep efficiency (less REM sleep and lower sleep efficiency were associated with reduced TUG performance), although these associations did not reach statistical significance.
Conclusion: Adequate sleep quality across midlife years may be an important modifiable contributor of improved mobility and balance in later life.
Support (if any): This work was supported by the National Heart, Lung, and Blood Institute (R01HL62252) and the National Institute on Aging (R01AG058680) at the US National Institutes of Health.

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0770

THE IMPACT OF ACUTE SLEEP EXTENSION ON BLOOD PRESSURE IS DEPENDENT ON SLEEP QUALITY

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Introduction: About 30% of the U.S. population sleep less than 7-hours per night, with this proportion of adults having a greater prevalence of hypertension than adults that meet the recommended amount of sleep. Middle-aged to older adults are of particular interest as they have lower sleep durations than younger adults, and suffer from higher rates of cardiovascular disease. Therefore, more research is needed in this population to understand the impact of sleep duration on vascular health. The aim of this study was to determine the impact of one night of sleep extension on blood pressure and microvascular function in middle-aged to older adults.
Methods: Sleep and daily physical activity were objectively measured at home for two weeks using wrist actigraphy in 22 adults (60 ± 15y). Vascular measurements were made in the morning on the 8th and 15th day. Participants spent at least 10h in bed on the night prior to one of these testing days to extend sleep. Mean arterial blood pressure (MAP) and peak reactive hyperemia in the forearm were measured on each testing day.
Results: Reactive hyperemia and MAP were unaltered ($P>0.05$) by sleep extension in the total sample. However, adults that experienced improved sleep efficiency during extended sleep (n=10, 4.2 ± 1.4%) exhibited reduced MAP (-5.5 ± 4.6 mm Hg, $P=0.005$) while adults that had little change or decreased sleep efficiency (n=12, -1.7 ± 2.9%) showed no change in MAP. The reduction in MAP was significantly different between sleep efficiency groups ($P=0.005$, Hedges' $g = 1.21$) after adjustment for sex and moderate-to-vigorous physical activity.
Conclusion: These results suggest that one night of sleep extension has the potential to reduce blood pressure in midlife to older adults when the additional sleep time improves quality of sleep.
Support (if any): This study was funded by the American Heart Association (19IPLOI34760579; J.U. Gonzales).

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0771

SEX AND RACIAL DISPARITIES IN OBSTRUCTIVE SLEEP APNEA AMONG ADOLESCENTS

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Introduction: Obstructive sleep apnea (OSA) gender dimorphism in the pediatric population has not been elucidated, while there has been a paucity in studies with adequate representation of adolescents. We hypothesize that OSA prevalence in adolescents undergoing polysomnography (PSG) is higher among male sex subjects than their female peers, even after adjusting for body mass index and other covariates.

Methods: Retrospective review of adolescents 11 to 18 years old who underwent a PSG at Rady Children's Hospital between October 2016 and April 2022. Exclusion criteria: craniofacial and chromosomal anomalies, and neuromuscular disorders. Demographic characteristics included sex, age, BMI percentile, median income. The obstructive apnea hypopnea index (OAHI) was obtained from the PSG data. Moderate-Severe OSA was defined as OAHI³5 events/hour. Statistical analyses included chi-square tests, two sample t tests and non-parametric tests. Logistic regression was used for analysis of moderate-severe OSA and relevant predictor variables (age, sex, income and race/ethnicity)

Results: 1745 adolescents with a mean age of 14.1±2.1 years were included, 56.1% were males and 43.9% were female. 58.2% Hispanic, 24.1% NH-Whites, 4.3% NH-Asians/Pacific Islander (Asian/PI), 4.2% NH-Blacks/African American (Black/AA) and 6.6% NH-Other. Male sex adolescents had higher OAHI (median 4.2 [IQR, 1.6-13.7] vs median 1.9 [IQR, 0.7-5.6], higher moderate to severe OSA than females (44.9% vs 27.2%, p-value< 0.05) and higher BMI percentiles (median 97.5 [IQR, 82.1-99.2] vs median 95.1 [IQR, 73.9-98.5], p-value< 0.01). Univariate logistic regression identified higher odds of moderate-severe OSA in Males (OR: 2.18, 95% CI: 1.78-2.66) compared to their female peers. This association persisted (OR: 2.24, 95% CI: 1.81-2.76) even after simultaneous adjustment for age, BMI percentile and median income. Finally, when stratifying by sex, we identified that Hispanic ethnicity (OR: 1.76, 95% CI: 1.19, 2.60) and NH-Asian race (OR: 2.36, 95% CI: 1.21, 4.59) were associated with increased odds of moderate-severe OSA only among males but not females, when compared to their NH-White peers.

Conclusion: In a sleep laboratory population, we identified higher moderate-severe OSA prevalence in male adolescents compared to females even when accounting for BMI and other relevant covariates. In addition, we found novel ethnic/racial disparities within the male sex population.

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0772

OSA IMPROVEMENT DUE TO ATO-OXY IN CHILDREN WITH DOWN SYNDROME PREDICTS IMPROVED QUALITY OF LIFE

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Introduction: Obstructive sleep apnea (OSA) is highly prevalent in children with Down syndrome (DS). Current OSA treatments for children with DS have limited effectiveness, as positive airway pressure therapy is poorly tolerated and adenotonsillectomy is not curative in most children with DS. We recently showed that the combination of atomoxetine and oxybutynin (ato-oxy) reduced OSA severity by 51% in a small trial of children with DS. Health-related quality of life (HRQOL) scores improved with ato-oxy, but the improvement was not statistically significant when examined across all trial participants. Therefore we evaluated if HRQOL improvements were greater in participants with more significant improvement in OSA.

Methods: We compared baseline characteristics and changes in HR-QOL in children with DS age 7-17 years old who had a response (defined as obstructive apnea-hypopnea index [oAHI] improvement of >50% and reduction of oAHI to < 5 events/hour) vs. those who did not respond to ato-oxy. Participants received 4 weeks of ato-oxy (0.5 mg/kg atomoxetine and 5 mg oxybutynin) with polysomnography and assessment of HR-QOL using the PedsQL along with behavioral assessment using the Conners at baseline and after 4 weeks of treatment. Paired t-tests or chi square tests were used to compare baseline participant characteristics and linear regression with adjustment for baseline was used to compare treatment outcomes.

Results: 12 participants had data at both baseline and on ato-oxy. 42% of participants had a significant response to ato-oxy. There were no significant differences at baseline between treatment responders and non-responders in demographics, body mass index or OSA severity. Quality of life was significantly higher in ato-oxy responders compared to non-responders. Adjusted mean total PedsQL score was 75 (95% confidence interval: 64, 87) in responders compared to 61 (51, 70) in non-responders, p=0.048. Responders had better scores across Conners domains including attention and behavior, but these were not statistically significant compared to non-responders.

Conclusion: No characteristics predicted ato-oxy response for OSA treatment in children with DS. Children who had a significant response to ato-oxy had significant improvement in their quality of life.

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0773

ANTHROPOMETRIC AND POLYSOMNOGRAM FINDINGS IN A PEDIATRIC COHORT OF NIGHT EATERS AND NON-NIGHT EATERS

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Introduction: As the prevalence of pediatric obesity increases, it is important to understand the relationship between chronotype, daytime sleepiness, eating times, sleep disorders and obesity. The objective of this study is to describe chronotype, eating timings, daytime sleepiness, and PSG findings in pediatric patients presenting for sleep evaluation and to investigate relationships between eating times on chronotype, daytime sleepiness, obesity, and PSG parameters (both respiratory and non-respiratory).

Methods: IRB-approved cross-sectional, survey-based study completed, between May-August, 2023 during sleep clinic visit, at Nemours Children's Hospital, Delaware. Eligibility criteria

included age 11-17 years, English-speaking and developmentally appropriate. Validated surveys included: The Epworth Sleepiness Scale for Children and Adolescents (ESS-CHAD), The Morningness Eveningness Questionnaire (MEQ), and the Night Eating Diagnostic Questionnaire (NEDQ). Demographic and PSG parameters were obtained from EMR. Descriptive and comparative statistics were performed to compare surveys, PSG findings and anthropometrics between night-eaters and non-night eaters.

Results: Study participants (n=35) were 60% male, mean age 14.9 years (1.8). The mean BMI was 37.8 kg/m2 (9.8), mean BMI Z-score was 4.3 (3.1), 89% were obese, 63% had increased daytime sleepiness, 71% had an intermediate chronotype, and 31% were night eaters. The cohort was split into night eating and non-night eating group. Among the night eating group (n=11), mean BMI was 39.8 (5.8), BMI Z-score 3.89 (2.1), 100% were obese, 55% were abnormally sleepy, and 55% had a moderate evening chronotype. Among the non-night eating group (n=25) mean BMI was 36.9 (11.1), and mean BMI Z-score was 4.6 (3.4), 83% were obese, 67% were abnormally sleepy, and 83% had an intermediate chronotype. PSG parameters were similar in both groups except duration of N2 sleep, which was significantly higher in night eaters 60.5% (7.5) compared with non-night eaters 54.3% (9.6), p=0.05.

Conclusion: Night eating is associated with evening chronotype in this unexpectedly obese pediatric population. There were no observed differences in daytime sleepiness, or respiratory parameters between night eaters and non-night eaters. Further studies with a more varied BMI are necessary. Night eaters had significantly higher duration of light (N2) sleep compared to non-night eaters.

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0774

REFINING A PRIMARY CARE NAVIGATION INTERVENTION TO ADDRESS SLEEP DISPARITIES: CAREGIVER AND CLINICIAN PERSPECTIVES

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Introduction: There are well-known racial, ethnic, and socioeconomic disparities in the incidence and treatment of pediatric sleep-disordered breathing (SDB). Addressing these disparities through culturally-tailored interventions could increase effectiveness and acceptability. As care navigation models have been beneficial in addressing modifiable patient and system-level barriers to care, we qualitatively explored participants' perspectives of a sleep navigation (SN) program in primary care to inform future intervention refinement.

Methods: Thirty-three English-speaking caregiver-child dyads (child Mage= 7.1□4.2 years; 51.6% girls; 100% Black, 3% Hispanic/Latinx; 93.5% maternal caregiver; 61.2% living ≤125% US poverty level) referred to SDB specialty care by their primary care provider were randomly assigned to clinical decision support (CDS) or to CDS with SN. SN was a 1-3 session program designed to support families in completing their SDB referral through motivational interviewing and care coordination strategies. Primary care clinicians (n=21) also participated in the study. We conducted semi-structured qualitative interviews with 10 caregivers (5 from CDS only, 5 from CDS + SN) and 9 clinicians to assess acceptability and perspectives on SN optimization. Interview data were coded and analyzed using thematic analysis.

Results: Overall, clinicians and caregivers that received SN reported strong acceptability. Participants also noted the benefits of racial concordance for families and navigators in transferring health knowledge to improve health literacy. Caregivers reported positive changes in their child's sleep health and a better understanding of SDB. Themes related to SN refinement included adding tailored patient education such as audio-visual and written materials and enhancing strategic family-provider communication. Clinicians emphasized that SN could be enhanced beyond referral completion by including support for families needing additional SDB care (e.g., surgery) and through in-person, warm handoffs in clinics to build trust between families and navigators. Clinicians also recommended exploration of a broader navigation program that could integrate multiple primary care referrals and resource needs (e.g., food insecurity).

Conclusion: SN was perceived as highly acceptable by primary care clinicians and families of primarily Black and/or lower-income backgrounds. Sustainability of the resultant model requires additional refinement to determine optimal implementation strategies that integrate sleep navigation with other primary care needs.

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0775

POLYSOMNOGRAPHY CHARACTERISTICS OF INFANTS PRESENTING WITH BRUE: A SINGLE CENTER EXPERIENCE

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Introduction: Brief resolved unexplained events (BRUE) commonly seen in infants, is not a specific diagnosis but a description of a sudden, brief, and now resolved episode. It includes one or more of the following presenting features: Cyanosis or pallor; absent, decreased, or irregular breathing, marked change in tone or altered level of responsiveness. Polysomnograms (PSG) are often performed as part of workup for infants presenting with BRUE. But the utility of PSGs in BRUE workup algorithm has not been well studied.

Methods: In this single center retrospective study, we reviewed clinical data from 100 consecutive infants (0-1 years) presenting with BRUE, of which 32 infants had PSG performed as part of workup.

Results: Age ranged from 12 days to 7 months: median age being 3 months. 23 out of 32 infants presented with apnea while 6 infants presented with change in color. 24 infants had obstructive sleep apnea (OSA); 3 infants had mixed sleep apnea; 3 infants had central sleep apnea (CSA) and 2 were normal. 10 infants had severe OSA, 9 had moderate OSA while 5 had mild OSA. Most common clinical diagnoses in our cohort were gastro-esophageal reflux disease (GERD) (17 infants) and laryngomalacia (8 infants). In our cohort, infants with GERD and laryngomalacia had higher AHI overall.

Conclusion: Though BRUE is a transient event, it is frightening to the observer leading to significant anxiety to parents. Because of the diverse presentations, causes, and prognoses of infants presenting with acute events, evaluation and management should be individualized. The clinical challenge is to identify the infants who may benefit from further testing and prolonged observation, while avoiding unnecessary testing. In our cohort, most of the infants presenting with BRUE did not undergo PSG. But among those who had PSG, it showed significant findings in infants which led to further intervention. PSG can be a useful non-invasive tool in the workup of selected infants with BRUE combined with clinical judgement. A normal PSG can also allay anxiety and be extremely reassuring for parents.
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0776

POLYSOMNOGRAPHY IN NEONATES WITH MYELOMENINGOCELE: VARIABILITY IN SCORING AND INTERPRETATION

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Introduction: A prospective, longitudinal, multicenter study was designed to test the hypothesis that sleep-disordered breathing (SDB) is ubiquitous among newborns with myelomeningocele (MMC). We evaluated variability in polysomnography (PSG) scoring and interpretation.
Methods: Nine US pediatric centers participated. Neonates with MMC born at >30 weeks gestation underwent bedside PSG at ≥35 weeks postmenstrual age, before hospital discharge. PSGs were scored by registered technologists (RPSGTs) at each site using AASM Scoring Manual infant criteria and interpreted by a board-certified sleep medicine physician (BCSMP). A single, central RPSGT blinded to clinical outcomes then re-scored all PSGs. One of two pediatric BCSMPs reviewed each study; the two BCSMPs jointly determined diagnoses for consensus central reports. Differences in scoring and overall PSG interpretation were evaluated with kappa and intraclass correlation coefficients (ICC).
Results: For 110 neonates with MMC, the median apnea-hypopnea index (AHI) was 26.5 [11.3-43.3] as reported by sites, and 23.0 [IQR 13.0-44.8] as reported centrally (κ 0.81). The central apnea index (CAI) was also scored similarly by sites (3.3 [0.9-7.0]) and centrally (2.6 [0.6-7.3]; κ 0.88), as were hypopneas (15.2 [7.5;26.9]) and 14.1 [6.4;27.9]; κ 0.82). However, the obstructive apnea index (OAI) was reported to be much higher by sites (10.0 [1.9-29.1]) than centrally (1.5 [0.5 – 4.1]; κ 0.29). Moreover, overall PSG interpretation differed between sites and central reviewers. Obstructive sleep apnea (OSA) was reported as a diagnosis by sites for 57.6% of neonates, vs. 10.9% by central review (ICC 0.06); central sleep apnea was reported by sites for 26.6% of neonates, vs. 14.5% by central review (ICC 0.50). When hypopneas were the most prevalent respiratory events, central review favored a less specific diagnosis of sleep-disordered breathing.
Conclusion: Considerable variability in scoring of obstructive apneas, and in polysomnography-based diagnoses, may exist for neonates. Sites may have designated hypopneas as obstructive, driving the diagnosis of OSA, while central review noted equivocal features of neonatal hypopneas, leading to a less specific diagnosis of sleep-disordered breathing. Further work to develop infant respiratory scoring rules, and diagnostic criteria, and to evaluate their clinical use may be warranted.
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0777

RESPIRATORY SLEEP PHENOTYPES IN PRADER-WILLI SYNDROME: DOES THE TYPE OF MUTATION MATTER?

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Introduction: Prader-Willi Syndrome (PWS) is a congenital disorder with three types of mutation: deletion (DEL), maternal uniparental disomy (UPD), and imprinting center defects (IMP). Sleep breathing disorders and sleep disruption may change the clinical evolution of these patients. The study aimed to evaluate the clinical characteristics of PWS patients according to genetic mutation, characterizing their sleep phenotypes and focusing on sleep respiratory measures.
Methods: From a cohort (January 2014 to July 2021) 55 patients of the same research university center with confirmed PWS genetic diagnosis consented. We applied questionnaires for sleep disorders, physical examination, nasolaryngoscopy, and overnight polysomnography
Results: Participants were aged between 2 and 22 years with genetic confirmation for PWS: 28 DEL, 21 UPD, and 6 IMP, and 24 (43.6%) were male participants patients with UPD and DEL mutations underwent polysomnography. They were divided into three quartiles (Q1, Q2, and Q3) for each respiratory parameter: the apnea-hypopnea index (AHI), the time of SpO2 (minutes) during sleep (SpO2min), and T< 90%. The AHI values of Q3-DEL (AHI: 15.2) were higher than Q3-DUM (AHI: 10.3). The SpO2min in the DEL group was 62%, while in the UPD group it was 76%. Patients in the DEL group had a higher prevalence in longer quartiles with T< 90%.
Conclusion: PWS patients showed specific respiratory sleep phenotypes according to genetic diagnosis. We found that PWS patients with DEL had worse polysomnographic respiratory patterns. Further studies are needed to recognize the clinical implications of the sleep respiratory findings in the clinical endophenotype of PWS.
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0778

A NOVEL ENDOTYPE OF PEDIATRIC OBSTRUCTIVE SLEEP APNEA SYNDROME REVEALED USING K-MEANS CLUSTERING

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Introduction: With the recent emergence of precision medicine, endotype / phenotype research for sleep disorders has been increasing. However, there were still few related studies on pediatric obstructive sleep apnea syndrome (OSAS). The authors conducted this study to cluster pediatric OSAS patients using polysomnography (PSG) parameters and find new endotypes.
Methods: We retrospectively investigated the medical records of children and adolescents who had been diagnosed with OSAS (apnea-hypopnea index, AHI > 1/h on PSG) at the single sleep disorders center. We used age, total sleep time (TST), sleep latency (SL), REM sleep latency (RL), sleep efficiency (SE), wake time after sleep onset (WASO), and the percentage of stage N1/N2/N3/R (%N1/%N2/%N3/%R) for clustering. Prior to clustering, the dimensions of variables were reduced through uniform manifold approximation projection (UMAP). And then K-means clustering (KM) were used for clustering. We used average silhouette index (ASI) as evaluation metrics. After clustering, the differences among clusters were compared using one-way ANOVA.
Results: Total 306 subjects were enrolled (mean age 8.2 ± 4.1 years old, boy : girl = 194:112). There were statistical significant differences in pediatric daytime sleepiness scale (PDSS), children's depression inventory (CDI), and age (p-value < 0.01, respectively) among clusters. Sleep architectures, such as TST, SL, RL, WASO, and %N1/%N2/%N3/%R also showed a significance difference among clusters. There was no statistical significance in total AHI, SE, and sex. KM showed ASI 0.42 and revealed 4 clusters. Cluster 3 (daytime sleepiness with depressive mood, n=72) showed the higher PDSS (mean 13.9 ± 7.2) and CDI (mean 12.0 ± 9.6) than other clusters. Cluster 3 also showed the older age (mean 12.3 ± 3.1) than other clusters.
Conclusion: The authors revealed the novel endotype of pediatric OSAS accompanied by excessive daytime sleepiness and depressive mood regardless of AHI and SE, which were previously used as indicators of sleep quality. Further research is needed to identify new endotypes of pediatric OSAS that cannot be identified by the classic indicators.
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0779

HOME SLEEP APNEA TEST FOR MONITORING PEDIATRIC OBSTRUCTIVE SLEEP APNEA FOLLOWING MANAGEMENT WITH ADENOTONSILLECTOMY

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Introduction: Many children have residual obstructive sleep apnea (OSA) following adenotonsillectomy (AT). While in-lab polysomnography (PSG) remains the gold standard for re-evaluation, its limitations include cost, limited availability of pediatric sleep laboratories, and inconvenience to families due to disruptions in routine. Home sleep apnea testing (HSAT), used clinically in adults, presents an alternative to evaluate the effect of OSA treatment in children and improve access to care. Specifically, type II HSAT, may surpass limited-channel tests in accuracy. This study aims to evaluate the feasibility, acceptability, and preference of type II HSAT compared to PSG to evaluate treatment effect following AT in children with OSA.
Methods: This comparative effectiveness trial included children aged 5-12 years scheduled for a PSG to evaluate residual OSA following AT. Participants underwent type II HSAT in their home within one week of their clinical PSG. Children and parents completed questionnaires regarding preference and acceptability of type II HSAT versus PSG. The relationship between obstructive apnea-hypopnea index (OAHI) by HSAT and PSG was analyzed using Spearman correlation and Bland-Altman plots.
Results: In this preliminary analysis, 20 participants (10 female; mean age=9.5; Black/African American 70%; White 25%; Hispanic 10%) who attempted HSAT completed all study procedures. Thirteen (65%) parents reported HSAT was closer to a normal night's sleep compared to PSG, and 11 (55%) preferred PSG. Using an OAHI cutoff of 2 events/hour, OSA status by HSAT was the same as PSG for 16/20 (80%) participants. Spearman's correlation was 0.8 (p-value < 0.001). The Bland-Altman analysis revealed the average difference (-1.025), falling within the 95% limits of agreement (-4.694, 2.644).
Conclusion: Based on preliminary analysis, parents reported type II HSAT was feasible and closer to a normal night's sleep compared to PSG. Type II HSAT was accurate in detecting mild OSA and importantly, HSAT-derived OAHI correlated well with PSG. To further validate these initial findings, we aim to enroll 40 more patients in this ongoing trial. Type II HSAT appears to be acceptable and have comparable accuracy to be considered an alternative to PSG to re-evaluate OSA following AT in school-age children.
Support (if any): This research is supported by the AASM Foundation.

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0780

PEDIATRIC OSA ASSESSMENT TOOL TO PREDICT SEVERITY OF SLEEP DISORDERED BREATHING

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Introduction: In the general pediatric population, the prevalence of obstructive sleep apnea (OSA) varies between 2% and 5% with several well-established consequences, including learning disability and behavioral difficulties. Resources for evaluation are limited often with long wait times. The STOP-BANG questionnaire has facilitated OSA screening (in adults) and can also predict OSA severity. We developed a pediatric "Severe OSA Score" (SOS), for patients referred for polysomnography to predict severity of the OSA, hence facilitating appropriate triaging of available sleep studies.
Methods: An 8-item (10-point) SOS questionnaire was developed consisting of: snoring (+1), witnessed apneas (+2), restless sleep (+1), speech/developmental delay (+1), tonsillar hypertrophy (+1), craniofacial abnormality (+2), and body mass index (BMI) percentile < 5% or >95% (+1). This was administered prospectively to parents of consecutive patients between 2–12 years, scheduled for a polysomnography (PSG), at the Memorial

Hermann Sleep Disorders Center - Texas Medical Center, between December 2022 to February 2023. The obstructive apnea hypopnea index (OAHI) was calculated on PSG (using the American Academy Sleep Medicine scoring manual version 3.0). An OAHI cut-off of 1.5 events/hour was used as diagnostic for OSA. A comparison was made between SOS severity (Group 1: >5 and Group 2: ≤5) and the mean OAHI.
Results: 45 subjects were included with a M:F gender distribution of 2:1, a mean age of 6.5 years (SD +/- 2.9), and a mean BMI percentile of 74.8 (SD +/- 28.3). All patients were diagnosed with OSA. The mean OAHI was 19.6 events/hour (SD +/- 20.1) with an average SOS score of 4.6 (SD +/- 1.2). When comparing Groups 1 and 2, the difference in the mean OAHI was statistically significant with a mean of OAHI 29.9 versus 14.3 events/hour respectively (p-value of 0.01).
Conclusion: We were able to prospectively show a strong correlation between a score of >5 on the SOS risk tool and the mean OAHI in this pediatric cohort. This tool hence may be used to identify those children at higher risk for more severe OSA, thereby allowing us to select those patients for more urgent referral when resources are limited.
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0781

PERIOPERATIVE DELTA WEIGHT AND PEDIATRIC OBSTRUCTIVE SLEEP APNEA RESOLUTION AFTER ADENOTONSILLECTOMY

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Introduction: Obstructive sleep apnea (OSA) affects 1-5% of pediatric patients and has detrimental effects on childhood growth and development. Adenotonsillectomy (AT) is the most effective treatment for pediatric OSA but is correlated with postoperative weight gain in children. We hypothesized that higher perioperative weight gain correlates with lower rates of OSA resolution in pediatric patients.
Methods: We conducted a retrospective cohort study at a tertiary academic medical center analyzing demographic, weight, and polysomnography (PSG) data for 250 patients from 2-17 years of age between January 2021 and December 2022. We performed univariate and multivariate logistical regression analyses.
Results: Following AT, 27.7% (n=68/250) of patients had residual OSA (AHI>5). Compared to patients without residual OSA, those with residual OSA were predominately male (77.9% vs 60.2%, p=0.007), had a higher median age (7.5 years vs 6.2 years; p=0.04), a higher median weight (41.8 vs 27.7 kg; p=0.01), and a higher median preoperative BMI (27.7 vs 20.9; p=0.001). Logistic regression showed that for every one-unit (1 kg) increase in perioperative weight, the odds of residual OSA increase by 6.0% (OR=1.06, 95% CI=1.02-1.10). For every one unit increase in baseline AHI correlated to 2% increase in the odds of residual OSA (OR=1.02, 95% CI=1.01-1.03, P=0.001). The odds of having residual OSA increased by 92% for Black or African American patients (OR=1.92, 95% CI=1.04-3.55, P=0.037).
Conclusion: Perioperative weight gain around the time of AT is correlated to higher rates of residual severe OSA in children. Weight loss and/or control is an important adjunctive treatment to ensure OSA resolution.
Support (if any):

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0782

PERSISTENT OBSTRUCTIVE SLEEP APNEA IN MEDICALLY COMPLEX PEDIATRIC PATIENTS: A MULTIDISCIPLINARY TREATMENT APPROACH

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Introduction: Treatment of persistent obstructive sleep apnea (OSA) in medically complex pediatric patients can be challenging due to concurrent developmental delays contributing to poor adherence with positive airway pressure (PAP) therapy. There is limited literature describing a multidisciplinary approach to treating persistent OSA in medically complex pediatric patients utilizing a pulmonologist, otolaryngologist, sleep medicine provider, psychologist, nutritionist, and nurse coordinator. Objectives: 1: Describe the multidisciplinary approach to treating persistent OSA in children at our institution; 2: Review concurrent patient diagnoses and interventions recommended; 3: Report resulting decreased patient costs and increased access to care.
Methods: We developed a multidisciplinary OSA (MOSA) clinic for patients with recalcitrant OSA in November 2022 in a pediatric tertiary care setting. Patients with persistent OSA after adenotonsillectomy who failed PAP therapy were seen for treatment optimization. This included consideration for drug induced sleep endoscopy (DISE) and/or Hypoglossal Nerve Stimulator (HGNS), as well as an evaluation by sleep psychology, pulmonary medicine, and a sleep provider to improve PAP adherence. Data was collected and reviewed via retrospective chart review.
Results: Twelve clinic sessions have been completed and 46 pediatric patients have been evaluated (n=46) with an average age of 10.4 years (±5 years). 58% were referred for nonadherence to PAP therapy. The most prevalent concurrent diagnosis was developmental delay (n=36, 78%). Other diagnoses included Trisomy 21 (n=18, 46%), other genetic disorders (n=8, 17%), and autism (n=6, 13%). 61% (n=46) had >95th%ile BMI-for-age resulting in nutrition consultation. Surgical intervention was recommended for 41% (n=19) while 43% (n=20) were scheduled for ongoing desensitization to PAP therapy. Combining specialties reduced average patient travel by 220 miles and gas costs of $35.44. Wait times to see the otolaryngologist decreased from 9 months to 3 months. Due to high demand, a second clinic location will launch in February 2024.
Conclusion: Our MOSA clinic has provided significant value in treating complex pediatric patients with persistent OSA. This review identifies patients with comorbidities that may be good candidates for a multidisciplinary sleep clinic, the potential improvement in access to care, and cost savings for patients and families requiring complex care related to persistent OSA.
Support (if any):

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0783

QUALITY CARE OF PEDIATRIC PATIENTS UTILIZING CONTINUOUS POSITIVE AIRWAY PRESSURE FOR OBSTRUCTIVE SLEEP APNEA

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Introduction: Obstructive sleep apnea (OSA) is a sleep related breathing disorder affecting 1-5% of children across all age groups. If left untreated, there is a variety of adverse health effects. Adenotonsillectomy (AT) is a common treatment, however some benefit from the use of continuous positive airway pressure (CPAP) treatment. Due to significant improvements of symptoms when CPAP therapy is applied consistently, we aimed to assess our objective measurements of adherence to PAP therapy along with reduction in their signs and symptoms of OSA.
Methods: Utilizing the AASM Quality Measures, medical records from patients enrolled in the Children's Wisconsin Positive Airway Program were reviewed from January 2019 until December 2019. Guidelines were created for the objective use of CPAP, frequency of documentation for adherence, and symptom assessment within a year of CPAP initiation. The structure of the work was performed with the four step Plan-Do-Study-Act cycle and occurred from January 2020 to December 2020.
Results: Initial review included 62 unique patients started on CPAP during 2019. 61 patients (98%) had appropriate documentation of adherence and 53 patients (89%) with follow up, appreciated a reduction of OSA signs and symptoms. Processes included standardization of electronic medical record templates, respiratory therapist assessment prior to and during clinic visits, and scheduling of appointments when CPAP therapy was recommended. Results remained consistent despite changes during the COVID-19 pandemic and shifts to telehealth visits. 44 patients (100%) had appropriate documentation of adherence prior to their first clinic visit with 40 patients (93%) having a reduction in symptoms by the first clinic visit.
Conclusion: The development of systems to ensure appropriate usage of CPAP allow for reliable assessments of use and improvements. EMR templates can document CPAP adherence, and reassess symptoms, regardless of visit location or staffing model shifts. We had an initial note template and then developed an auto-populated hyperlink that could be used in telephone and clinic encounters for adherence. With standardization and awareness, we ensured patients were receiving optimal care and treatments were adjusted when challenges were apparent.
Support (if any): Internal funding provided by the Children's Wisconsin Department of Pediatrics

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0784

SPINAL MUSCULAR ATROPHY 1 GENETIC THERAPIES HALT DEVELOPMENT OF INFANTILE ONSET SLEEP-RELATED DISORDERED BREATHING

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Introduction: Natural history studies of Spinal Muscular Atrophy Type 1 demonstrate that patients typically require non-invasive ventilatory interventions in the first year of life for sleep-related disordered breathing (e.g. obstructive sleep apnea, central sleep apnea, and hypoventilation) due to the progressive development of neuromuscular weakness. There are currently no reports that analyze the effects that disease-modifying therapy has on the development of sleep-related disordered breathing.
Methods: This descriptive retrospective cohort study will utilize a Kaplan-Meier time-to-event analysis to determine whether administration of disease-modifying therapy delays diagnosis of sleep-related disordered breathing and halts initiation of ventilatory assistance in the first year of life.
Results: Six patients with spinal muscular atrophy type 1 followed by the division of pediatric neurology were included in the cohort. One patient received both nusinersen and onasemnogene abeparvovec in the first year of life and two patients received onasemnogene abeparvovec in the first year of life followed by risdiplam after one year of life. Three patients exclusively received onasemnogene abeparvovec in the first year of life. Four of the patients did not receive a sleep study, as respiratory pathology was not a concern at follow up visits due to preservation or improvement of motor strength. The two that received polysomnograms were diagnosed with obstructive sleep apnea after the first year of life with an average AHI of 4.1, average SpO2 nadir of 81.5%, and average total arousal index of 10.
Conclusion: Though a small sample size, there is some evidence to suggest that prompt initiation of disease-modifying therapy such as nusinersen, onasemnogene abeparvovec, ,and risdiplam can possibly halt the development of sleep-related disordered breathing in the first year of life and delay initiation of ventilatory support. Further controlled trials would be needed to further understand the relationship between disease-modifying therapy and sleep-related respiratory outcomes in pediatric patients with SMA type 1.
Support (if any):

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0785

EFFECTS OF SYMPATHETIC ACTIVITY ON ENERGY INTAKE IN UPPER AIRWAY OBSTRUCTION/ OBSTRUCTION REMOVAL MOUSE MODEL

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Introduction: Pediatric sleep-disordered breathing (SDB) increases the risk of accelerated body weight gain if the post-treatment weight is uncontrolled. Upper airway obstruction (AO)/ obstruction removal (OR) in rodents mimics many SDB characteristics, including increased food intake. Orexin, a peptide produced by hypothalamic neurons, emerged as one of the critical orchestrators of breathing and deregulation of feeding in AO/ OR animals. It is possible that orexin affects energy expenditure due to increased sympathetic activation of brown fat uncoupling protein-1 (UCP-1) that may contribute to weight gain following OR. We hypothesize that AO/OR induces elevation of sympathetic activity that leads to persistent increased feeding behavior.
Methods: We employed a mouse model to examine the impact of AO followed by OR two weeks later. The mice were observed for an additional eight to twelve weeks, roughly equivalent to two decades in human terms. We examined the impact of AO/ OR on feeding hormones, respiration (assessed through plethysmography), energy expenditure and intake (monitored in metabolic cages), nutritional preferences for a high glycemic index diet, and thermography using infrared cameras. We studied the impact of specific β3-adrenergic receptor blockade (L-748,337, 5 mg/kg) on energy balance.

Results: The heightened energy expenditure in AO was associated with an augmented breathing workload, elevated plasma norepinephrine levels, increased UCP1 levels, and an enhanced effort in breathing to maintain acid-base homeostasis. Elevated orexin and ghrelin levels were associated with increased energy intake. The AO mice's daily dietary glycemic index intake exceeded that of the control group by more than 250% compared to a low glycemic index diet. OR maintained heightened food intake, preference for a high glycemic index diet, and elevated energy expenditure despite normalized ventilation, associated with increased interscapular temperatures and brown fat UCP1 levels. The administration of L-748,337 reduces interscapular temperatures and decreases energy intake in the OR group.
Conclusion: The need to maintain respiratory homeostasis in AO animals is associated with abnormal energy metabolism and thermogenic capacity that are not reversible following OR. Obstruction removal is linked to persistent heightened feeding and increased sympathetic activity, even with normalized breathing and energy needs.
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0786

ASSOCIATIONS OF PHYSIOLOGICAL TRAITS WITH PEDIATRIC SLEEP APNEA SEVERITY: VARIATION BY RACE AND ETHNICITY

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Introduction: Adenotonsillar hypertrophy increases risk for pediatric obstructive sleep apnea (OSA), likely due to increased upper airway collapsibility. Pathophysiologic determinants for OSA (or endotypes) included greater pharyngeal collapsibility, reduced dilator muscle compensation, elevated chemoreflex loop gain, and altered arousal threshold. More severe OSA and higher prevalence of residual OSA after adenotonsillectomy in Black compared to White children suggest differences in endotypes. We aimed to determine the extent to which changes in endotypes vary with participant characteristics and may explain differences in OSA severity across groups.
Methods: Endotypes were estimated during REM- and NREM-sleep from baseline polysomnography in children with OSA screened for participation in the Childhood Adenotonsillectomy Trial (CHAT; N=1232; age:3-9.9(y); BMI(z):0.88±1.24 [mean±SD]; Black: 47.9%; Asian:2.1%; Female:52.8%). Race and ethnicity differences in REM- and NREM-AHI levels and endotypes were examined adjusting for age, sex, BMI(z), and time in lateral position. Multivariable regression models assessed associations of REM- and NREM-endotypes (per SD) with REM- and NREM-apnea-hypopnea index (AHI; events/h), mutually adjusted for other endotypes. Mediation analysis quantified the extent to which endotypic differences explained race differences in AHI.
Results: The sample had a baseline AHI:4.9±8.9; REM-AHI:10.6±19.7; NREM-AHI:3.6±7.6 (mean±SD). In sex, age and BMI-adjusted multivariable analyses, AHI was higher in Black (REM-AHI: 7.81±1.01 events/h; NREM-AHI: 1.57±0.30 events/h; β±SEM) and Asian (REM-AHI: 9.37±3.35 events/h) children compared to White children. Compared with White children, Black children had higher collapsibility (0.30±0.09; β±SEM) and higher arousal threshold (0.21±0.11) in REM, while Asian children had decreased compensation (REM: −1.06±0.22; NREM: −0.48±0.11) in REM and NREM. Sex or BMI(z) were not associated with collapsibility or compensation. Endotypic analysis, adjusted for lateral position only, showed that higher REM- and NREM-AHI were associated with greater collapsibility (REM: 13.64±1.73; NREM: 5.58±0.57; β±SEM), reduced compensation (REM: −4.22±0.98; NREM: −1.88±0.23) and higher arousal threshold (REM: 3.42±0.97; NREM: 0.72±0.17). Mediation analysis showed that the higher REM-AHI in Black children was partially explained by elevated arousal threshold (0.21 SD; percentage mediated=19 [95%CI:3-39]%).
Conclusion: Endotypes are associated with pediatric OSA severity, and partially explain race-associated differences in AHI. These results suggest opportunities for targeting mechanistic traits to improve the outcomes of surgical therapies for OSA.
Support (if any):

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0787

CLINICAL OBSERVATIONS AND CHARACTERISTICS OF A PEDIATRIC COHORT WITH OSA TREATED WITH PAP FOR OVER 10 YEARS

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Introduction: Despite intensive treatment and follow-up, adherence to positive airway pressure in children is poor, with many losing the device or simply being lost to follow-up. The purpose of this study was to describe the characteristics of and management interventions in a cohort of 28 patients with obstructive sleep apnea treated with positive airway pressure followed in a pediatric sleep center for 10 years or longer.
Methods: A retrospective chart review was performed on patients diagnosed with obstructive sleep apnea and treated with positive airway pressure that were followed in clinic between May 2007 and December 2023. Those that followed up for less than 10 years were excluded from the analysis. Demographic and clinical variables were reviewed. A descriptive statistical analysis was performed.
Results: In this cohort (85.7% male), the median age (interquartile range) at PAP initiation was 4 years (2-7). Comorbidities included 42.9% obese, 39.3% allergic rhinitis, 35.7% asthma, 28.6% intellectual disability, 17.9% ADHD, 17.9% Prader-Willi syndrome, 10.7% autism, and 10.7% Down syndrome. 92.9% received tonsillectomy, 85.7% adenoidectomy, 50% uvulapalatopharyngoplasty, and 10.7% turbinate trim. . Polysomonogram (PSG) results [median (IQR)] included apnea-hypopnea index 15.89 per hour (10.15-29.25), arousal index 15.7per hour (11.85-25.85), 77.8% had oxygenation defects, and 22.2% ventilation defects.67.9% (19) participated in an intensive adherence program, with 42.1% (8) graduating the program The most common interventions/recommendations were mask/tubing replacement (22.2%), PSG ordered (11.8%), pressure change (10.5%), and changing mask type (10.3%). Of those changing masks, 45.3% changed from nasal to full-face, 15.1% from full-face to hybrid, and 13.2% from hybrid to full-face. Median PAP adherence across all patients and visits was 94.15 (81.88-99) and usage for four hours or more was 77.9 (54.10-90.93).
Conclusion: This study provides a detailed overview of demographical and clinical characteristics of and the management

interventions for OSA in a pediatric cohort followed for over a decade. Further statistical analyses including multivariate analyses are in progress.
Support (if any): none

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0788
EFFECT OF SLEEP STATE AND POSITION ON OBSTRUCTIVE RESPIRATORY EVENTS IN 12 - 24-MONTH-OLD TODDLERS

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Introduction: As per our knowledge, very limited number of studies have investigated the effect of sleep states and body positions on respiratory events distribution in toddlers aged 12-24 months. We aimed to investigate this relationship in this specific age group.
Methods: This was a single center, retrospective study that included normal toddlers between the ages of 12 and 24 months diagnosed with OSA with overnight polysomnography. Toddlers with obstructive apnea hypopnea index (OAHI) of 2 or greater were included. Patients with Down syndrome, neuromuscular disease were excluded. REM, NREM and different body positions AHI were collected, in addition to REM and NREM mean end-tidal carbon dioxide level (EtCO2) and mean oxygen saturation (SaO2).
Results: A total of 95 toddlers (68 males, 27 females) between 12 and 24 months old met the criteria. 48.4% of patients were Caucasian, 37.9% were African American and 4.2% were Hispanic. Median times (%) spent in REM and NREM were 21 and 79.1, respectively. Median time (minutes) in different body positions were supine 147, right side 53.4, left side 58.5, and prone 42.35. Median REM AHI was 8.45, higher than median NREM AHI of 1.1 ($p< 0.001$, IQR: 3.475-24.875 and IQR: 0.3-4.5, respectively). Median REM SaO2 was 98% (IQR: 97-99) and median NREM SaO2 was 98 %(IQR: 97-99), with no statistical difference. REM EtCO2 median was 41 (IQR: 40-44) and median NREM was 42 (IQR: 40-44), with no statistical difference. Median AHI while supine was 2.15 (IQR: 0.4-9.1), on right side was 0.8 (IQR: 0-7.25), on left side was 1.1(IQR: 0-8.8), and while prone was 0 (IQR: 0-5.2). The median supine AHI compared to off-supine AHI showed no significant difference ($p=0.6252$).
Conclusion: Toddlers suffering from OSA have worsening AHI during REM sleep, however their SaO2 and EtCO2 does not significantly change compared to NREM sleep. Additionally, sleep position does not affect AHI distribution this population.
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0789
IMPLEMENTATION OF AUTO CPAP PATHWAY TO REDUCE THERAPY WAIT TIMES FOR OSA MANAGEMENT IN CHILDREN

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Introduction: Auto-titrating Continuous Positive Airway Pressure devices (auto CPAP) has been reported to be safe and well tolerated in children. This study evaluates the impact of the implementation of the auto CPAP pathway on therapy wait times for obstructive Sleep Apnea (OSA) management in children.
Methods: All children 2-18 years of age diagnosed with OSA at Nationwide Children's Sleep Center and started on PAP therapy in 2023 were included in the study. Descriptive statistics for demographics and student's t -test to compare the two groups for time to initiation of therapy were calculated using R open-source software version 4.3.2.
Results: Among study participants, 30 children (mean age 14.6 years; range 9.7 to 17.6 years) were set on auto-CPAP and 32 children (mean age 13.4 years; range 5.7 to 17.9 years) were set up on CPAP after completing titration study. The median number of days from diagnostic PSG to auto-CPAP set up was 39 days (range of 9 to 139 days), as compared to a median of 74 days (range of 5 to 544 days) from diagnostic PSG to CPAP set up after completion of a titration study; P value was 0.002. The median number of days from order placement to auto-CPAP set up was 23 days (range of 2 to 69 days). Compliance data at 90 days was available in 17 children in the auto-CPAP group and 29 children in the titration-study CPAP group. A trend for higher compliance in auto-CPAP group (47%) versus the titration-study CPAP group (34%) was noted (P value = 0.09).
Conclusion: Implementation of auto-titration CPAP pathway significantly reduces the time to therapy initiation in children with OSA and should be offered when clinically indicated. Our results also indicate that delay from order placement to auto-CPAP setup is a key driver to delay in therapy initiation.
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0790
POLYSOMNOGRAPHIC INSIGHTS INTO THE ADHD AND OSA CONNECTION IN CHILDREN

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Introduction: Attention-deficit/hyperactivity disorder (ADHD) is closely linked to sleep disorders, particularly obstructive sleep apnea (OSA), but their relationship remains poorly understood. Polysomnographic studies on sleep disruptions in ADHD have yielded inconsistent results. Few have studied polysomnograms in stimulant-medicated versus non-medicated children with ADHD+/-OSA. This study aimed to elucidate pathognomonic

polysomnographic sleep disturbances in children diagnosed with ADHD+/-OSA.
Methods: Medical charts and polysomnograms were retrospectively reviewed for children ages 4-18 who underwent overnight polysomnography at a tertiary care center from 2019-2022. ADHD diagnosis was determined by ICD code F90, and moderate to severe OSA was defined by apnea-hypopnea indices (AHI) ≥5 events/hour. Four groups were evaluated: children without OSA or ADHD, children with OSA-alone, children with ADHD-alone, and children with ADHD+OSA. Statistical analyses identified significant differences among variables of interest.
Results: 4,013 children met the study criteria. 2,372 children were without OSA and without ADHD (59.1%), 1,197 with OSA-alone (29.8%), 333 with ADHD-alone (8.3%), and 111 with ADHD+OSA (2.8%). Insomnia (ICD code G47.00) was prevalent in children with ADHD-alone. However, they exhibited significantly better sleep efficiency, a polysomnographic proxy for insomnia, than children with OSA-alone, and sleep efficiency did not significantly differ from the other groups. No significant difference in periodic limb movements (PLMs) was found across all groups. Children with ADHD+OSA had higher BMIs than those with OSA-alone and ADHD-alone. The above results held true even after correcting for stimulant usage.
Conclusion: The polysomnographic marker of sleep efficiency falls short in explaining the frequency of insomnia diagnoses in children with ADHD. Enhanced subclinical polysomnographic biomarkers are needed to identify sleep characteristics unique to ADHD. In children with ADHD+OSA, polysomnogram results do not reveal any unique sleep parameters that cannot be better explained by OSA alone. Those with ADHD+OSA exhibit higher BMIs than those with ADHD alone, underscoring the importance of screening for OSA in children with ADHD symptoms, especially those with above-average BMIs.
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0791

POLYSOMNOGRAPHIC OUTCOMES OF OBSTRUCTIVE SLEEP APNEA IN INFANTS WITH PIERRE-ROBIN SEQUENCE

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Introduction: Children with Pierre-Robin sequence (PRS) are known to have a high association with sleep-disordered breathing (SDB). Mandibular distraction osteogenesis (MDO), a surgical process involving lengthening of the jaw, has been used to improve SDB in these patients, preventing the need for tracheostomy or positive airway pressure therapy. Currently, limited data regarding polysomnographic outcome of SDB after mandibular distraction is available. Therefore, we aimed to assess the prevalence of SDB in pediatric patients with PRS and the polysomnographic outcome of MDO.
Methods: This was a single-center retrospective study that included children with confirmed PRS who underwent polysomnography (PSG) for evaluation of SDB. Obstructive sleep apnea (OSA) severity was categorized by the obstructive apnea-hypopnea index (OAHI) as normal (< 1 events/hr), mild (1–4.9 events/h), moderate (5–9.9 events/h), and severe (≥ 10 events/h). Pre- and post-MDO PSG variables were compared using a paired t-test.
Results: Baseline PSG data were available for 16 children (8 males, 8 females) with mean age 374.2 days. Average BMI was 14.4 (±2.4 kg/m3) and 87.5% of patients were Caucasian. OSA prevalence was 87.5%, apnea hypopnea index (AHI) was severe in 68.8% and the mean AHI was 46.3 (± 43.8). Eleven patients had MDO with a mean age of 27.1 days (± 20.5) at time of MDO and distraction duration of 33.2 days (± 7.6). Six patients had pre and post MD PSGs. Average total sleep time (TST) increased significantly from 207.3 min (± 85.7 min) to 351.3 min (± 126.7 min); p=0.023. Average apnea-hypopnea index (AHI) and average REM AHI decreased significantly from 79.0 events/h (± 41.6 events/h) to 18.2 events/h (± 25.0 events/h), p=0.017; and 106.3 events/h (± 43.4 events/h) to 37.0 events/h (± 51.0 events/h), p=0.040, respectively. Average oxygen saturation nadir during sleep significantly improved from 72.0% (± 5.1%) to 85.2% (± 12.4%), p=0.030; and percentage of carbon-dioxide time spent above 50 mmHg improved significantly from 68.0% (± 17.7%) to 49.8% (± 6.0%) p=0.027.
Conclusion: Children born with PRS have a high prevalence of severe OSA. Additionally, MDO significantly improves TST, AHI, oxygen saturation nadir, and CO2 levels in children with SDB and PRS.
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0792

RELATIONSHIPS BETWEEN AGE, REM SLEEP, AND SLEEP DISORDERED BREATHING ACROSS THE FIRST 24 MONTHS OF LIFE

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Introduction: Infant airway anatomy and immature central respiratory systems place infants at risk for sleep disordered breathing. Further, infant sleep is comprised of higher amounts of rapid eye movement (REM) sleep, with a steady decline across the first twenty-four months. Compared to the controlled breathing rate during non-REM (NREM), REM sleep has an erratic rate. The combination of immature anatomy and increased REM amount predispose infants to greater apnea risk, yet there is a poor characterization of age- and REM-associated changes in disordered breathing across the first twenty-four months.
Methods: We retrospectively analyzed 95 clinical sleep studies from 50 infants (M=10.5 months, SD = 7.6., F=24), each had one to four records, who were being evaluated for sleep disordered breathing. We investigated the average number of combined central and obstructive apnea events per hour, controlling for age of infant, and percentage of total sleep time in both NREM

and REM, respectively, using a Poisson regression within the Generalized Linear Mixed Model (GLMM) framework.
Results: Infants slept on average 371 minutes (SD=121), of which approximately 33% (SD=12%) was spent in REM. We observed an average of 5.3 apnea events per hour (SD = 5), with a median of 3.5 [IQR: 1.7, 7.9], unadjusted, which we found varied by age (p<.05). During the first year, higher apnea event rates were observed at one and six months, while the lowest apnea rate occurred at three months of age. Between 12 and 24 months, rates stabilized, mirroring those observed at three months, but with a noticeable increase at 18 months. There was a strong relationship with REM sleep, with 3.2 times more apnea events per hour during REM versus nREM. This increased rate during REM was consistent across age, including when adjusted for the percentage of REM sleep and sex (RR=3.18, 95% CI 2.61, 3.89, p<.001).
Conclusion: We observed a dynamic relationship between age, REM sleep, and total apnea events across the first twenty-four months of life. As infants are at higher risk for apnea, evaluating age- and REM-associated apnea changes may provide new assessment and intervention targets in sleep disordered breathing.
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0793

SLEEP DISORDERED BREATHING IN CHILDREN WITH CRANIOFACIAL SYNDROMES

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Introduction: Children with Craniofacial Syndrome (CFS) are known to have a higher risk for Obstructive Sleep Apnea (OSA) due to various craniofacial abnormalities. We aim to assess OSA prevalence in a single cohort of children suffering from CFS and to stratify them by degree of OSA (mild, moderate, severe) and the overall management of OSA in CFS.
Methods: This was a single-center retrospective study that included children with confirmed CFS who underwent overnight polysomnography (PSG). OSA severity was categorized by obstructive apnea-hypopnea index (OAHI) as normal (< 1 event/hr), mild (1–4.9 events/h), moderate (5–9.9 events/h), and severe (≥ 10 events/h).
Results: PSG data were available for 46 children; 58.7% were male, with a mean age of 4.8 years. The average BMI was 18.2 (SD + 5.4 kg/m2) with an average z-score of 1.1 (SD + 4.0), and 76.1% of patients were Caucasian. Common referring symptoms were snoring (38.1%), witnessed apneas (29.1%), gasping/choking (17.4%), and oxygen desaturation (15.1%). The most common CFS was Pierre Robin Sequence (PRS) in 34.8%. OSA prevalence was 68.2% (23.3% mild, 20% moderate, 56.7% severe). The mean polysomnographic variables were total sleep time 346.2 min (± 120.0), AHI 22.2 (± 32.4), SaO2 nadir 83.8% (± 12.1), maximum CO2 level 54 mmHg (± 9.9), and arousal index 22.2 (± 23.4). The overall treatments consisted of mandibular distraction in 26.5%, continuous positive airway pressure therapy in 12.2%, tracheostomy in 6.1%, oxygen supplement in 2%, and lip-tongue adhesion in 2%.
Conclusion: In our cohort of children with CFS had a high prevalence of OSA with severe degree as the prevalent severity. PRS was the most common CFS and mandibular distraction was the most commonly performed procedure in infants with PRS.
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0794

NORMATIVE TRANSCUTANEOUS CARBON DIOXIDE (TCCO2) VALUES IN OLDER CHILDREN

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Introduction: Transcutaneous carbon dioxide monitoring (TCCO2) is being increasingly used in pediatric sleep studies to assess for hypoventilation. However, consensus is lacking on a pediatric definition for hypoventilation. This study evaluates the applicability of adult hypoventilation definitions to healthy older children.
Methods: Subjects, 10 years to 18 years of age, participating in a study on sleep EEG dynamics in typical developing children were included. All participants underwent an in-lab nocturnal polysomnography with Natus Sleepworks TM system and following American Academy of Sleep Medicine (AASM) guidelines. Sentec monitor (Therwil, Switzerland) was used for TCCO2 recording. Studies were scored according to the AASM pediatric criteria. Nocturnal hypoventilation was evaluated according to the following definitions: – Over 25 percent of sleep time with a TCCO2>50 mmHg [AASM], – A peak of TCCO2>50 mmHg [S Ward, 2005], – A percentage of nighttime with a TCCO2>50 mmHg>2 % [R Paiva, 2009], – A TCCO2>10 mmHg above the morning awake minimal TCCO2 level [FJ O'Donoghue, 2003].
Results: Preliminary results on 7 subjects of which 71 % were females are presented. The mean age was 14.7 years (SD 2.6 years) and mean BMI was 22.2kg/m2 (SD 2.3). All subjects had an obstructive AHI of < 1; Mean awake TCCO2 was less than 45; Mean asleep TCCO2 was less than 50. There were no subjects with TCCO2 values >50 for over 25 % time or with delta TCO2 sleep to awake of >10 mmHg. There was one subject with peak TCCO2 values>50 and one subject withTCCO2 values >50 for 15 % time.
Conclusion: Our results, with no healthy child having >25 % of sleep time with TCCO2 over 50 mmHg, support the use of AASM hypoventilation definition in older children. When validity of AASH hypoventilation criteria is questionable due to sleep time < 4 hours or low REM sleep fraction, then an increase of

sleep CO2 of 10 units as compared to awake values may also be used to identify hypoventilation.
Support (if any): Research Institute, Nationwide Children's Hospital

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0795

QUANTIFYING GUIDELINE ADHERENCE: SLEEP TESTING IN THE PEDIATRIC DOWN SYNDROME POPULATION

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Introduction: Down Syndrome (DS) is the most common chromosomal disorder, occurring in 1 in every 700 births. Clinically reported symptoms of obstructive sleep apnea (OSA), such as snoring, have been shown to be unreliable for predicting the presence of OSA in the DS population. With the prevalence of OSA in this vulnerable population estimated between 50-79%, and the lack of guidance that the traditional symptoms provide in clinical decision making, the American Academy of Pediatrics (AAP) recommends all children with DS be screened for OSA with polysomnography (PSG) before their 4th birthday. Previous studies conducted shortly after the publishing of these guidelines showed suboptimal adherence. Both DS and OSA impact medical costs over time, with OSA leading to a doubling of medical expenses (cite) and DS increasing it twelve-fold. Early diagnosis and treatment of OSA in children with Down Syndrome is imperative to improving morbidity in this patient population and lowering overall healthcare cost and utilization.
Methods: In this retrospective chart review, an electronic medical record (EMR) query for all patients aged 3-8 years, with a diagnosis of DS, and who live in Illinois was performed. The query included if any sleep clinic or PSG orders were placed and when these orders were completed. The query yielded a convenience sample of 582 children.
Results: Only 26% (117) of the subjects had a sleep medicine clinic or PSG order in their chart with 21% (124) having completed a PSG, and 11% (62) completed a sleep medicine visit. Only 23% (111) of patients between 4-8 years old were compliant with AAP sleep testing guidelines.
Conclusion: There is opportunity to strengthen the process of screening DS patients for OSA. The low adherence to AAP guidelines shown in this, and previous studies, highlight the need for dedicated quality assurance and improvement programs aimed at closing this practice gap, especially within institutions who care for sizable Down Syndrome populations.
Support (if any): none

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0796

IMPLEMENTATION OF THE SAN DIEGO SLEEP SURVEY (SDSS) IN CHILDREN WITH DOWN SYNDROME

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Introduction: Obstructive sleep apnea (OSA) is highly prevalent in children with Down syndrome (CWDS). Polysomnography is advised in all CWDS under four years, but at all ages, OSA prevalence remains as high as 75%. Polysomnography in CWDS requires skilled pediatric sleep labs, which are scarce. Implementation of comprehensive sleep questionnaires to identify sleep disorders could lead to earlier recognition and treatment however validated sleep questionnaires in CWDS are not widely available.
Methods: Caregivers of patients aged 1 to 21 years referred to Rady Children's Hospital Sleep Center, San Diego, CA, completed the San Diego Sleep Survey (SDSS) via the Epic® EMR system. CWDS were identified using diagnostic codes (ICD-9/10). Additionally, surveys were collected from children without sleep complaints (control) at San Ysidro Children's Dental Center and Chula Vista Medical Plaza. The SDSS, a 51-item scale, employed a 4-item Likert-type scale (Never, Sometimes, Usually, Do Not Know) for finely graded insights into sleep problems. Five domain scores assessed pediatric sleep problems: insomnia, sleep-disordered breathing (SDB), sleep disorder (e.g., parasomnia), sleep hygiene, and daytime symptoms (DS). A subset also completed the Pediatric Sleep Questionnaire (PSQ) and Children's Habit Sleep Questionnaire (CSHQ) for comparative purposes.
Results: 2103 patients completed SDSS (age 8.6±4.8) at the Sleep Center. Of these, 134 CWDS were identified (age 8.1±5.1; 58 females [43%]). Compared to controls (n=135, age 9.4±2.4), CWDS had significantly better hygiene scores (8.8±2.0 vs 9.9±2.3, $p< 0.01$), and significantly higher insomnia scores (14.4±3.8 vs 12.9±3.3, $p< 0.01$), SDB scores (17.3±5.2 vs 13.8±6.1, $p< 0.01$) and DS scores (23.6±6.7 vs 19.5±5.9, $p< 0.01$). Sixty-five CWDS completed the PSQ, which identified 27 children (43%) with a positive SDB score (PSQ Total Score ≥8), compared to 104 children (63%) with a positive SDB score on SDSS. Thirty-eight CWDS completed the CSHQ; all had a positive score (CSHQ Total Score ≥41).
Conclusion: The SDSS is a feasible method for evaluating sleep disturbance in CWDS, recognizing abnormalities in various domains including SDB. Future analyses will compare SDSS to PSQ and CSHQ to assess convergent validity for screening for sleep disorders. Sensitivity and specificity of SDSS to identify OSA compared to polysomnography will be explored.
Support (if any):

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0797

AFRAID TO SLEEP ALONE: CHARACTERISTICS OF PARENTS AND SCHOOL-AGE CHILDREN WHO CANNOT SLEEP INDEPENDENTLY

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Introduction: A surprising number of school-age children (5 - 12) do not sleep independently. Every night, the child sleeps in the parent's bed, or a parent sleeps in the child's bed. This habit eventually becomes very frustrating for parents. But when they try to get their child to sleep alone, the child becomes intensely anxious and vigorously resists. The ensuing struggle can bring chaos to family routines and distress to everyone. The problem is surprisingly common, occurring in up to 10% of school-age children. Nevertheless, it has received little systematic attention.

Methods: 1,630 parents completed an online survey. All the parents had a school-age child (5 to 14 years) who routinely co-slept with a parent (in the parents' bed or the child's bed). The parents identified the habit as a problem. Parents accessed the survey alongside an accompanying online article about this sleep habit.
Results: The overwhelming majority of children (>67%) had never learned to sleep alone. Most parents reported that the problem was very distressing to them, disrupted their sleep, disrupted family routines, and interfered with sexual intimacy. When parents tried to get their child to sleep alone, the child displayed extremely elevated anxiety and protest, even panic. Parents' efforts were unsuccessful and left them frustrated and worried about their child's psychological health. Yet 81% of these children had never received any mental health treatment. Among mothers, about 63% reported they had a history of anxiety disorder themselves, twice the rate of the general population. Among fathers, the rate of reported anxiety disorder was about the same as in the general population. These findings imply that clinical interventions with this population need to specifically address mothers' challenges with anxiety.
Conclusion: Challenges in transitioning from co-sleeping to sleeping alone occur commonly, disrupt routines, and cause marked distress. These dynamics can be understood as involving sleep associations, parental accommodation, ineffective limit setting, and anxiety escalation. Behavioral interventions can be very effective. This presentation will describe one such approach that typically resolves the problem in less than two weeks and can be implemented by parents acting on their own as they follow a treatment guideline.
Support (if any):

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0798

FEASIBILITY & ACCEPTABILITY OF SAFE: A BRIEF TRAUMA-INFORMED BEHAVIORAL SLEEP INTERVENTION FOR YOUTH IN FOSTER CARE

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Introduction: Children who have spent time in foster care unsurprisingly experience high rates of sleep problems and disorders, which negatively impacts well-being. Sleep and Adjustment in Foster Environments (SAFE) is a brief, telehealth-delivered behavioral sleep intervention for caregivers of young children in or adopted from foster/kinship care. Building upon existing evidence-based behavioral sleep strategies by using a trauma-informed approach, SAFE promotes children's self-regulation, felt safety, and connection with foster caregivers to improve sleep. Using data from a randomized controlled pilot study, we explored the feasibility and acceptability of SAFE compared to an active control condition (Sleep Education Support; SES), which provided families with a mailed informational booklet about young children's healthy sleep.
Methods: Foster/kinship caregivers and adoptive foster parents of children ages 2-5 years were recruited across Texas. Children with organic sleep disorders (e.g., OSA), major medical conditions/disorders, and/or autism were ineligible. Beliefs about treatment were assessed pre-treatment with the Credibility/Expectancy Questionnaire; perceived intervention utility and acceptability were assessed post-treatment with the Client Satisfaction Questionnaire and via qualitative interviews.
Results: Over an 18-month period, N=127 families inquired about the study, 78 were screened, and 67 were eligible. Of these, 22/67 (33%) did not move forward due to scheduling difficulties (n=9), no longer being interested (n=8), or loss of contact (n=5). The remaining 45 eligible families were randomized to SAFE (n=22) or SES (n=23). Among SAFE families, 21/22 (95%) completed all three intervention sessions and the post-treatment assessment. Among SES families, 20/23 (87%) completed the post-intervention assessment. Primary factors influencing study withdrawal included the child leaving the home and scheduling difficulties. Results of independent-samples t-tests revealed significantly higher treatment satisfaction in the SAFE group (M=29.57, SD=4.78) compared to the SES group (M=23.95, SD=7.00; t=-2.988, p=.005). Groups did not significantly differ in treatment credibility or expectancy.
Conclusion: SAFE appears feasible and acceptable to foster/adoptive caregivers. While both groups reported similar baseline beliefs about treatment and shared positive post-treatment feedback, satisfaction was greater for the SAFE group. Results underscore a need for sleep health interventions tailored to this population.
Support (if any): This study was funded by the Grant to Enhance and Advance Research (GEAR) from the University of Houston.

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0799

DO WEIGHTED BLANKETS IMPROVE SLEEP AMONG CHILDREN WITH A HISTORY OF TRAUMA? A RANDOMIZED CONTROLLED CROSSOVER TRIAL

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Introduction: Sleep problems (e.g., trouble falling asleep, nighttime awakenings) are highly prevalent and persistent among children with a history of trauma/ maltreatment and elevate their risk for a range of deleterious outcomes. Weighted blankets have gained popularity in recent years as a potential non-pharmacological intervention for improving sleep in clinical populations of children, but their efficacy has not been examined among children with a history of trauma and/or maltreatment. Therefore, this study explores whether the use of a weighted blanket for sleep improves objective and subjective sleep outcomes among a group of children adopted from foster care (i.e., with a history of trauma/ maltreatment).
Methods: The current study used a randomized, within-subjects, crossover design where participants used a weighted blanket for two weeks and their usual blanket for two weeks in a counterbalanced order. Participants were N=30 children (63% female), ages 6 to 15 years (M = 9.7, SD = 2.9), adopted from foster care in Texas. Sleep outcomes were measured using actigraphy and subjective sleep diaries.
Results: Results indicated no meaningful differences in the type of blanket used in either actigraphy-based estimates of total sleep time ($t(27) = 0.10$, $p = .91$, $d = 0.02$), sleep onset latency ($t(27) = 0.14512$, $p = .88$, $d = 0.03$), or wake minutes after sleep onset ($t(27) = -0.44$, $p = .65$, $d = -0.08$), or subjective total sleep time ($t(27) = 0.75$, $p = .45$, $d = 0.14$), sleep onset latency ($t(25) = 0.28$, $p = .78$, $d = 0.06$), or sleep quality ratings ($t(26) = 1.97$,

p = 0.06, d = 0.38). Period effects were also examined for each variable; however, results were all also non-significant with small effect sizes. Child age, biological sex, and timing of participation (school year versus summer months) did not impact outcomes.
Conclusion: While this study did not find significant differences in sleep outcomes based on type of blanket used, controlled studies using larger samples of children with a history of maltreatment are needed.
Support (if any): We thank Luna Blankets (www.lunablanket.com) for donating the weighted blankets used in this study.

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0800

EVALUATION OF THE SLEEP PROFILE IN CHILDREN WITH CRI DU CHAT SYNDROME: A PILOT STUDY

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Introduction: Cri du Chat (CDC) syndrome is a rare genetic condition caused by the deletion of the short arm of chromosome 5, and it affects 1:50,000 live births. It is characterized by global delay in neuropsychomotor development, frequent behavioral alterations, and complaints of sleep fragmentation. The prevalence of sleep problems in CDC syndrome varies from 12 to 64%. So far, it is not completely established whether there is a higher prevalence of sleep disorders in individuals with this syndrome compared to the 20-30% prevalence in neurotypical (NT) children.
Methods: This is a pilot study in which the Sleep Disturbance Scale for Children questionnaire was applied to parents (or caregivers) of 11 patients with CDC syndrome and 11 age-matched NT individuals (controls) to determine the profile of sleep quality in the cohort. In the CDC group, inclusion criteria involved the availability of the molecular array exam, confirming the diagnosis of CDC syndrome.
Results: Sixty eight percent of the sample was male, and the age of participants ranged from 2 to 31 years. Daytime sleepiness, difficulty in falling asleep again after waking up during the night and awakenings during the night were significantly more frequent in the CDC group (p=0.025, 0.0004 and 0.027, Chi-squared test, respectively). No significant differences between groups were observed in relation to total sleep time, sleep latency and bed resistance. Our preliminary data showed that wake after sleep onset is 2.5x more frequent in CDC patients than in NT.
Conclusion: Our pilot study showed that CDC group presented worse sleep parameters in comparison to NT controls. Awakenings during the night and the presence of daytime sleepiness in the CDC group may be a manifestation of non-restorative sleep in this population. Better documenting the prevalence and profile of sleep disorders in this syndrome will allow the improvement of the challenging behavioral issues frequently observed in this condition. The increase in the number of participants in this study will certainly deeper characterize the sleep disturbances in these patients. Further clinical trials will be critical to develop more individualized treatment strategies to individuals with CDC syndrome.
Support (if any): AFIP, CNPq, FAPESP.

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0801

THE RELATIONSHIP OF OBJECTIVELY MEASURED SLEEP TO PUBERTY IN SCHOOL-AGE CHILDREN WITH FAMILIAL AUTISM

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Introduction: The onset of puberty brings changes in sleep patterns in neurotypical school-aged children, shifting circadian timing and decreasing total sleep time. Sleep problems affect over 80% of school-aged autistic children. The predominant autism sleep phenotype involves longer sleep onset latency, night wakings, and early morning waking—defining features of insomnia. Research on the relationship of puberty to sleep problems, sleep duration, and sleep onset timing in autistic children is limited.
Methods: 232 school-aged children (age 6-13 years; Male n=142, Female n=90) participated in a sleep study through the longitudinal, multisite Infant Brain Imaging Study (IBIS) network. Participants were ascertained at 6-months-old for having an older autistic sibling (high-likelihood; HL) or no family history of autism (lower-likelihood; LL). The HL group included 47 diagnosed with autism (HL+), 104 without autism (HL-), and an LL comparison group of 81. The participants with actigraphy were categorized as Pre-puberty (n=89) or In-puberty (n=38) based on Tanner Staging. Measures include sleep problems (Children's Sleep Habits Questionnaire, CSHQ), sleep duration and sleep onset time (via 10 days actigraphy and sleep diary).
Results: Sleep problems were significantly increased in the HL+ group compared to HL- and LL groups (CSHQ; $p< 0.01$; $\chi2=23.736$). Sleep onset times were later for the In-Puberty versus Pre-Puberty HL- group by 52.2 minutes (Kruskal-Wallis; p=0.01), and later, but not statistically significant, for the HL+ group by 43.2 minutes and LL group by 6.6 minutes. Sleep duration was lower, but not statistically significant, for the In-Puberty versus Pre-Puberty HL+ group by 36.6 minutes and HL- group by 37.2 minutes, and higher for the LL group by 3 minutes (ns).
Conclusion: Overall, parent-reported sleep problems were increased in school-age HL autistic children compared with HL- and LL children. Objective measures revealed In-Puberty HL+ and HL- had notably later sleep onset times and decreased sleep duration compared with Pre-Puberty. However, only HL- sleep onset time was significantly later. This pattern suggests sleep characteristics could be associated with familial autism and puberty. Future studies with a larger sample are needed to further evaluate the effect of puberty on sleep in autism.
Support (if any): R01 HD101578

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0802

ADOLESCENTS' IN-GAME PURCHASE, PROBLEM GAMING, GAMBLING GAME PLAYING ASSOCIATED WITH POOR SLEEP QUALITY

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Introduction: Problem gaming and sleep deprivation among adolescents represent critical issues in public health. Online gaming frequently incorporates monetary features, like microtransactions, blurring the line between gaming and gambling. More than half of parents are worried that their children feel pressured to make in-game purchases (Ofcom, 2023). Research has shown an association between problem gaming and heightened psychological distress as well as reduced sleep quality in adolescents. In Taiwan, there has been a notable increase in online game and gambling game advertisements across both offline and online platforms in recent decades. This study aims to explore the relationships between adolescents' exposure to marketing, parental involvement, in-game purchases, problem gaming, engagement in gambling games, psychological distress, and sleep problems in Taiwan.
Methods: Data were gathered from a sample of 2595 seventh-grade students across 30 middle schools in both urban and rural areas of Taiwan. A self-administered questionnaire was conducted in 2020. A panel of 8 experts was invited to assess the content validity of the questionnaire. The questionnaires were distributed to students in their classrooms by trained interviewers. Approval was obtained from the Institutional Review Board at National Taiwan Normal University.
Results: The findings revealed that 94% of adolescents engaged in online gaming, with 38% making in-game purchases, 9% participating in online gambling games, and 32% reporting poor sleep quality. The multiple regression results showed that adolescents exposed to higher levels of gaming marketing, involved in in-game purchases, and experiencing lower levels of active parental mediation were more likely to have problem gaming. Furthermore, adolescents with increased exposure to gambling game marketing, influenced by advertising effects, involved in in-game purchases, and experiencing problem gaming, were more likely to engage in online gambling games and purchase tokens. Additionally, adolescents involved in in-game purchases, problem gaming, and playing online gambling games were more likely to experience higher psychological distress and poor sleep quality.
Conclusion: Adolescents' engagement in in-game purchases, problem gaming behaviors, and playing online gambling games has been linked to increased risks of psychological distress and poor sleep quality.
Support (if any): This research was supported by a research grant from the Taiwan Ministry of Science and Technology.

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0803

INSOMNIA, MOOD, AND QUALITY OF LIFE IN CHILDREN AND YOUNG ADULTS WITH CONGENITAL HEART DISEASE

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Introduction: While mortality rates have decreased in patients with congenital heart disease (CHD), numerous comorbidities associated with CHD persist, including decreased health-related quality of life (HRQOL), depressed mood, and sleep problems. Insomnia is known to worsen mood and HRQOL in children without CHD, therefore we examined the relationship between insomnia, mood and HRQOL.
Methods: We recruited 38 individuals with CHD between the ages of 4-25 years and assessed insomnia, health-related quality of life, anxiety, and depression using the Pediatric Insomnia Severity Index (PISI), Pediatric Quality of Life Inventory (PedsQL), Screen for Child Anxiety Related Disorders (SCARED), and Center for Epidemiological Studies Depression Scale for Children (CES-DC). T-tests were used to compare differences in HRQOL, anxiety, and depression in individuals with CHD with and without comorbid insomnia. Logistic regression was used to assess whether the presence of insomnia can predict increased odds of clinically significant anxiety or depression.
Results: Individuals with CHD and insomnia (PISI score ≥8) demonstrated significantly lower health-related quality of life, more depressive symptoms, and higher total anxiety compared to individuals with CHD without insomnia. Individuals with insomnia had a mean HRQOL score of 63.1 ± 15.6 vs 77.8 ± 18.9 in the group without insomnia (p=0.03). Individuals with insomnia had a mean total depression score on the CES-DC scale of 21.5 ± 14.6 vs 7.3 ± 5.6 for those without insomnia (p=0.009). Clinically significant depression in the insomnia group was 24 times greater (95% confidence interval [95% CI] 2.3-247.4, p=0.008) compared to those without insomnia. The mean total anxiety score for individuals with insomnia was 25.0 ±19.6 compared with 12.4 ± 10.3 in those without insomnia (p=0.03), and the odds of clinically significant anxiety in the insomnia group vs those without insomnia was 4.44 (95% CI 0.9-21.8, p=0.07).
Conclusion: Insomnia is associated with markedly worse HRQOL, depression and anxiety in individuals with CHD. Further study is needed to evaluate the role of insomnia recognition and treatment in order to improve HRQOL and mood in children and young adults with CHD.
Support (if any): No support

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0804

ACCEPTABILITY AND PATIENT-CENTERED OUTCOMES FOR INFANT BEHAVIORAL SLEEP INTERVENTION IN BLACK FAMILIES

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Introduction: While the efficacy and acceptability of infant behavioral sleep intervention has been developed and tested in White families, less is known about how Black mothers understand and perceive behavioral sleep recommendations. The objective of the Sleep Guidance in Black Families with Infant Children (SLUMBER) study was to evaluate the perspectives of Black mothers with infants on the acceptability and cultural appropriateness of standard infant behavioral sleep recommendations. As part of this study, we examined maternal perspectives

on participation in an infant behavioral sleep program and desired patient-centered outcomes.
Methods: Participants were recruited through Black parent groups on Facebook and WhatsApp, along with more general social media campaigns targeting individuals who identified as Black. Semi-structured interviews were conducted with Black mothers (n=18; 55.6% with a college degree) with an infant < 9 months (M=4.5, SD=2.8; 66.7% male). Interview transcripts were analyzed within the NVivo software using a grounded theory thematic descriptive approach.
Results: Many mothers (n=11, 61.1%) indicated a high interest level in participating in a sleep program. Facilitators to participation included addressing current problem areas with their infant's sleep and social support. The most identified barrier to participation was potential poor alignment between program recommendations and personal values, particularly pertaining to the acceptability of approaches involving infant crying without immediate intervention. Desired program outcomes that mothers most frequently described included a more consistent or predictable sleep/wake pattern, their baby learning to sleep independently, and increased sleep consolidation.
Conclusion: Black mothers endorsed high interest in participating in an infant behavioral sleep program, although over one-third were not interested. Personal and cultural alignment with program recommendations is important to parents, supporting the need for culturally sensitive interventions, with particular attention to variability in perceived acceptability of approaches involving infant crying. Infant behavioral sleep intervention programs should focus on achieving patient-centered outcomes, such as schedule consistency and sleep consolidation.
Support (if any): This research is supported by The Center for Injury Research and Policy at Nationwide Children's Hospital through Grant Number R49CE003074 from the Centers for Disease Control and Prevention. Dr. Chung's time is supported by the National Heart, Lung, and Blood Institute under award number 1K01HL169419-01.

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0805

MELATONIN USE AMONG CHILDREN IN FOSTER CARE: ASSOCIATIONS WITH SLEEP AND DAYTIME BEHAVIOR

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Introduction: In recent years, melatonin use has risen steeply in children of all ages. It is also the most commonly recommended intervention for sleep problems among children in foster care (Alfano et al., 2022) despite a lack of evidence of its safety and efficacy for children with a history of maltreatment/trauma. This study therefore investigated and compared aspects of sleep and daytime emotional/behavioral problems among children in foster care who have and have not been administered melatonin.
Methods: Survey data from N=454 caregivers from across the U.S. who were currently fostering children between the ages of 4- and 11-years-old (M=6.39, SD=2.20) were examined (McGlinchey et al., 2023). Caregivers were recruited for an anonymous online survey via private Facebook groups for foster families. Questions included whether or not they had ever administered melatonin to the foster child, aspects of the child's sleep, and emotional/behavioral problems. Children included in the sample were relatively diverse, with 17% Black/African American and 11% Hispanic children from 46 U.S. states.
Results: Forty-eight percent (48%; n = 221) of foster caregivers reported administering melatonin to their child currently or in the past. ANCOVAs controlling for level of foster care (i.e., children with special needs) revealed melatonin use was associated with poorer sleep quality, $F(1, 423)=25.118$, $p<.001$, partial $\eta^2=.056$, and increased severity of daytime behavioral problems, $F(1, 410)=21.843$, $p<.001$, partial $\eta^2=.051$, based on medium effects. However, melatonin use was not associated with child depressive, $F(1, 441)=2.151$, $p=.143$, partial $\eta^2=.005$, or anxiety symptoms, $F(1, 422)=1.198$, $p=.274$, partial $\eta^2=.003$.
Conclusion: Children in foster care who are taking/have taken melatonin are reported to have worse quality sleep and more daytime emotional/behavioral problems than children in foster care not taking melatonin, but not more depressive or anxiety symptoms. The extent to which greater daytime problems might be a result of poorer nighttime sleep remains to be understood. Although our study has limitations, it is one of the first to examine behavioral correlates of melatonin use among children in foster care.
Support (if any):

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0806

THE EFFECT OF A SLEEP PROMOTION PROGRAM IN ADOLESCENTS WITH INSUFFICIENT SLEEP: A RANDOMIZED CONTROLLED TRIAL

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Introduction: Adolescent sleep is compressed by early school start times and often competes with school, extracurricular, and social demands. Insufficient and mistimed weeknight sleep contributes to large shifts in weekend-weekday sleep-wake schedules, which may lead to adverse physical and mental health outcomes. The Sleep Promotion Program (SPP) is a brief, scalable, behavioral intervention that aims to increase sleep duration and regularity while building motivation and efficacy to change sleep behaviors. This secondary analysis tested whether the SPP changed actigraphy-assessed sleep.
Methods: Participants (ages 13-15) with insufficient and irregular sleep (N=44) were randomized to the SPP intervention (n=24) or waitlist control (n=20). The SPP included sleep psychoeducation and a face-to-face clinician session, relying on evidence-based strategies for promoting sleep within a motivational interviewing framework. Participants wore an ActiWatch during their baseline and follow-up which occurred after the intervention or the waitlist period. We hypothesized participants randomized to SPP would lengthen and stabilize sleep from baseline to follow-up compared to controls. We tested a group (intervention vs. waitlist) by time (baseline vs. follow-up) interaction on actigraphy-assessed sleep duration, timing, and regularity (weekend-weekday shift in timing) using multilevel models with a random intercept.
Results: We included 38 participants with at least 4 weekday nights and 1 weekend night of actigraphy (n=23 intervention, n=15 waitlist). The intervention group delayed their weeknight

bedtimes (~45 minutes; b=0.69, SE=0.27, p=0.01), delayed their weeknight waketimes (~1 hour; b=0.68, SE=0.32, p=0.03), and simultaneously decreased the difference between weekend-weekday bedtimes (b=-1.1, SE=0.5, p=0.04) compared to controls (i.e., increased regularity). Weekend sleep timing and total sleep time did not change significantly.
Conclusion: The SPP intervention regularized weekend-weekday sleep timing in adolescents with insufficient and irregular sleep, likely driven by delaying weeknight sleep times. Given that this study was primarily conducted during the COVID-19 pandemic, when many participants reported delayed school start times, participants randomized to SPP were able to regularize their weekend-weekday sleep schedules while simultaneously adapting their weeknight sleep schedules to better fit their preferred timing. Regularizing sleep may be an attainable first step to improving sleep in adolescents. Future work will examine whether sleep regularization associates with mental health outcomes.
Support (if any): K23HD087433, Pittsburgh CTSI

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0807
FERRIC CARBOXYMALTOSE VERSUS IRON SUCROSE FOR PEDIATRIC SLEEP-RELATED MOVEMENT DISORDERS

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Introduction: Intravenous (IV) ferric carboxymaltose (FCM) and iron sucrose have previously been reported as effective therapies for sleep-related movement disorders (SRMDs) in children. While FCM has a more robust ability to optimize iron stores, iron sucrose is sometimes required instead due to insurance coverage. In this study, we compared clinical and laboratory outcomes of children in our center who underwent either FCM or iron sucrose infusion for SRMDs.
Methods: This was a retrospective study of all children who underwent either IV FCM or iron sucrose infusion in our outpatient infusion center between 1/2023 and 12/2023. While FCM was initially requested for all children, iron sucrose was ordered instead if dictated by insurance coverage. Children were included if the infusion was ordered by a pediatric sleep physician for treatment of confirmed SRMD, there were baseline and follow-up ferritin results available, and there was follow-up clinical information regarding sleep symptoms.
Results: Overall, there were n=40 iron infusions (n=18 FCM and n=22 iron sucrose) that had follow-up clinical and laboratory data available for analysis. There were no significant differences in weight, age, sex, or baseline ferritin level between groups. Children who underwent FCM infusion had significantly higher follow-up ferritin levels compared with iron sucrose (117.9 +/-52.1 vs 69.7+/-38.8 ng/mL, p=0.002) despite longer time to follow-up lab draw (71.3+/- 40.5 vs 28.1+/-37.1 days, p=0.010). Clinical improvement in sleep was noted in children underwent FCM and iron sucrose (72.2% vs 63.6%, p=0.564). Repeated infusions were needed significantly more often with iron sucrose compared with FCM (27.3% vs 0.0%, p=0.024). Each group had 1 case of mild gastrointestinal symptoms during infusion, otherwise no significant infusion reactions were noted. There were no cases of significant hypophosphatemia noted following FCM infusion (mean=4.4+/-0.7, none < 2.0 mg/dL).
Conclusion: Intravenous iron therapy is a safe and effective treatment modality for pediatric SRMDs. FCM is superior to iron sucrose both in terms of improvement in ferritin level as well as decreased need for repeated infusions.
Support (if any): None.

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0808
NIGHTTIME DISTRIBUTION OF PERIODIC LIMB MOVEMENTS OF SLEEP AFTER SURGICAL OSA TREATMENT IN PEDIATRIC POPULATION

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Introduction: Increased periodic limb movements of sleep (PLMS) can occur in patients with sleep disordered breathing. Changes in PLMS following treatment for obstructive sleep apnea (OSA) are observed, but poorly understood. In adults, PLMS are typically seen in the first portion of the night whereas OSA events occur most frequently during the latter portion. To better understand the link between pediatric PLMS and OSA, we investigated whether nighttime distribution of pediatric PLMS could predict resolution of PLMS following surgical management of OSA.
Methods: A retrospective study was performed in children and adolescents aged 1-18-year-olds who had pre-operative PSG showing OSA (OAHI ≥1.5/hr) and significant PLMS (PLM index [PLMI] ≥5/hr) before undergoing surgical treatment for OSA and subsequent post-operative PSG. The cohort was divided into 2 groups based on post-operative PSGs; (1) sustained PLMS with PLMI index >5/hr post-operatively and (2) resolved PLMS with PLM index < 5/hr postoperatively. PLMS distribution was qualified by calculating PLMI during each third of the night of pre-operative PSG. The age, PSG parameters and PLMS distribution were compared between patients with sustained PLMS and resolved PLMS.
Results: Twenty-seven subjects met the criteria for entry into analysis; 14 patients with sustained PLMS and 13 patients with resolved PLMS. Sustained PLMS had higher overall PLMI compared to resolved PLMS (15.13±8.02/hr vs. 9.77±5.88/hr, p=0.03). Sustained PLMS had a higher PLMI during the first third of the night on pre-operative PSG compared to resolved PLMS (15.99±10.37/hr vs. 6.05±8.02/hr, p=0.01). There were no significant differences in PLMS in the middle and last thirds of the night, BMI, age (6.37±4.20 vs. 5.07±4.10 years) at sleep study, AHI, or OAHI (8.11 vs. 6.04).
Conclusion: Children with PLMS that resolved after surgical treatment for OSA have less frequent PLMS in the early part of the night and a lower overall PLMI compared to children with sustained PLMS. This suggests that PLMS occurring in the first third of the night are independent of sleep disordered breathing and are likely associated with other conditions such as sleep related movement disorders. The distribution of PLMS may help prioritize children with OSA and PLMS who require further evaluation of RLS/PLMD post-operatively.
Support (if any):

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0809

CIRCADIAN PHASE DELAYS FROM SCHOOL NIGHTS TO WEEKENDS AND RELATES TO SLEEP CHARACTERISTICS IN HIGH SCHOOL STUDENTS

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Introduction: Developmental shifts towards later sleep/circadian timing during adolescence are often at odds with early school start times, resulting in circadian misalignment and sleep restriction, as well as stark differences between sleep timing/duration on school nights versus weekends. While the sleep aspects of this mismatch have been well-characterized, limited objective data addresses within-person changes in circadian phase across the week. In a sample of high school students, this project aimed to (1) characterize within-person changes in circadian phase from school nights to weekend nights, and (2) examine whether later circadian phase relates to other sleep/circadian characteristics across the full week.
Methods: Sample included 115 high school students (mean age 17.3, 55.7% female, 88.7% White) reporting at least one "standard drink" of alcohol in their lifetime. Participants completed baseline self-report measures, wrist actigraphy for 8 days, and two overnight visits (Thursday and Sunday) for salivary melatonin sample collection. The Munich Chronotype Questionnaire assessed chronotype and social jetlag. Actigraphy measures included sleep onset latency (SOL), wake after sleep onset (WASO), total sleep time (TST), and midsleep timing. Circadian phase was calculated as the dim light melatonin onset (DLMO; 4 pg/ml threshold). Actigraphy and DLMO measures were separately calculated for school nights, weekends, and overall (mean). Linear regression was used to examine associations, covarying for sex, race, and SES.
Results: Circadian phase (DLMO) was systematically later on Sunday (mean 37+/-41 minutes later; d=0.68, p< 0.00). Later school night DLMO was associated with longer SOL (b=0.05,p=0.002), shorter WASO (b=-0.03,p=0.018), and shorter TST (b=-0.18,p=0.001) on school nights, as well as later chronotype (b=-1.72,p< 0.0001). Later weekend DLMO was associated with longer TST (b=0.22,p=0.042) on weekends. Later DLMO (school night, weekend, overall) was associated with larger weekday-weekend differences in actigraphic TST (p's< 0.001) and more social jetlag (p's< 0.03).
Conclusion: Circadian phase shows systematic within-person differences across school nights and weekends, broadly paralleling social jetlag based on sleep timing. While later circadian phase was associated with later chronotype, as well as more difficulty falling asleep and less sleep on school nights, this was specific to circadian phase assessed on school nights. Future studies should consider day-of-week of circadian assessments.
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0810

IMPACT OF SCHOOLING ON THE MEASUREMENT OF MULTIDIMENSIONAL SLEEP HEALTH IN ADOLESCENCE

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Introduction: Multidimensional Sleep Health (MSH) is an emerging concept in sleep and circadian science that aims to capture the 24-hour experience of sleep and identify individuals in the population with good sleep health. While schooling is one of the most important contextual variables impacting adolescent sleep, little is known about how it impacts the measurement of MSH. In the present study, we examined differences in adolescent MSH while they were either in-school or on-break.
Methods: We studied 377 adolescents (16.4±2.3 yr; 46.4% female; 21.5% racial/ethnic minority) from the Penn State Child Cohort, a randomly-selected population-based sample, with 63% of the sample (n=236) in-school when sleep data were collected. We used the MSH RU-SATED framework – regularity, satisfaction, alertness, timing, efficiency, and duration – to derive a composite score of sleep health using actigraphy and self-reports.
Results: Adolescents in-school had a marginally (p=0.07) higher MSH score (3.12±1.2) than those on-break (2.87±1.4). Adolescents on-break were more likely to have optimal alertness (37.8% vs 31.8%, p< 0.05) and duration (37.2% vs 61.5%, p< 0.05), but less likely to have optimal timing (30.8% vs 61.8%, p< 0.001) and efficiency (34.6% vs 50.9%, p< 0.001) compared to those assessed while in-school. The differences observed in the timing and duration domains were driven by on-break adolescents mean sleep midpoint being more than an hour later than those in-school (4:42 am vs 3:36 am, p< 0.001) and having a mean sleep efficiency slightly below the cut-off of 85% (84.3% vs 85.9%, p< 0.05).
Conclusion: Accounting for contextual factors in adolescents, specifically whether they are attending school or not, is important for the measurement of MSH. Future work should derive cut-offs for optimal sleep health specific to adolescents as well as potentially include other timing dimensions beyond average sleep midpoint, such as social jetlag.
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0811

MULTIDIMENSIONAL SLEEP HEALTH AND ITS ASSOCIATION WITH CARDIOMETABOLIC HEALTH IN ADOLESCENCE

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Introduction: Multidimensional sleep health (MSH) aims to promote physical and mental well-being and capture the 24-hour experience of sleep by using measures of nighttime sleep and daytime functioning. We have previously updated the existing adolescent MSH model to incorporate objective and subjective measures and, in the present study, we examine its utility in

identifying associations between MSH and Metabolic Syndrome (MetS), a cluster of five established risk factors of cardiovascular disease.
Methods: We studied 377 adolescents (16.4±2.3 yr; 46.4% female; 21.5% racial/ethnic minority) from the Penn State Child Cohort, a randomly-selected population-based sample. We used the RU-SATED framework–regularity, satisfaction, alertness, timing, efficiency, and duration–to derive an MSH score using actigraphy and self-reports. A continuous MetS score was calculated as the sum of sex-and-age adjusted z-scores of waist circumference (WC), mean arterial blood pressure (MAP), homeostatic model assessment of insulin resistance (HOMA-IR), triglycerides, and HDL.
Results: Overall, better MSH was not significantly associated with lower cMetS (β=-0.07, p=0.22); however, it was significantly associated with lower WC (β=-0.12, p< 0.05). When we examined each MSH dimension and its association with each component of cMetS, good sleep timing was significantly associated with lower WC (β=-0.13, p< 0.05) and higher HDL (β=0.11, p< 0.05) and good sleep efficiency was associated with lower cMetS (β=-0.11, p< 0.05) and lower MAP (β=-0.11, p< 0.05). When we examined each dimension continuously, we found that higher ratings of excessive daytime sleepiness were associated with higher cMetS (r=0.12, p< 0.05) and WC (r=0.11, p< 0.05), more morningness was associated with lower fasting triglycerides (r=-0.10, p< 0.05), later sleep midpoint was associated with lower HDL (r=-0.13, p< 0.05), and longer sleep duration was associated with lower MAP (r=-0.12, p< 0.05) and HOMA-IR (r=-0.11, p< 0.05).
Conclusion: Better sleep health is significantly associated with central obesity, the key driver of MetS. Additionally, our analyses demonstrate that specific dimensions of MSH may contribute differently to cardiometabolic health in adolescence.
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0812

MODELLING THE IMPACT OF REALLOCATING SLEEP AND PHYSICAL ACTIVITY ON ANXIETY AND DEPRESSION SYMPTOMS IN ADOLESCENTS

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Introduction: Insufficient sleep and sedentary behavior, both associated with increased anxiety and depression symptoms, are highly prevalent in US adolescents. Our lab previously found that extending adolescents' sleep duration decreased sedentary behavior (SB). However, the impact of replacing time spent in unhealthy behaviors (e.g., SB) with healthy behaviors (e.g., sleep, light physical activity [LPA], moderate-to-vigorous physical activity [MVPA]) on mental health is unknown. Therefore, we aimed to understand the impact of replacing SB and time-in-bed (TIB) with LPA and MVPA on anxiety and depression symptoms in habitually short-sleeping adolescents using isotemporal modeling.
Methods: Baseline data from a study of habitually short-sleeping (≤7 hours on school nights) and physically inactive (< 3h MVPA/week) adolescents ages 14-19 years were analyzed. During one week of home monitoring, thigh-worn accelerometry assessed SB, LPA, and MVPA; wrist-worn actigraphy estimated TIB. Participants completed PROMIS Anxiety and Depressive Symptoms scales. Isotemporal substitution modeling, which uses cross-sectional data to predict the effect of reallocating time spent in one activity with an equal amount of time spent on another, was used to estimate the effect of movement behavior reallocation on mental health symptoms.
Results: Thirty-four adolescents completed study measures (age=16.0±1.2 years, 70% female, 88% Non-Hispanic White). Reallocating 1 hour/day of SB to an equal amount of LPA within the model was associated with a 4.5-point improved depression T-score (p=0.019) but no difference in anxiety symptoms (p>0.10). Neither replacing 1 hour/day of SB with TIB or MVPA nor replacing 1 hour/day of TIB with LPA or MVPA within the model were associated with changes in depression or anxiety symptoms (all p>0.10).
Conclusion: Replacing 1 hour/day of SB with LPA but not MVPA was associated with significantly lower depression symptoms in habitually short-sleeping, physically inactive adolescents. However, neither reallocation of SB to TIB nor of TIB with PA was associated with mental health symptoms. As this modeling analysis is cross-sectional in nature, further prospective research is needed to evaluate the impact of replacing SB with healthy behaviors, including meeting recommended sleep and PA guidelines, to determine impacts on adolescent wellbeing.
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0813

SLEEP DURATION MODERATES THE ASSOCIATION BETWEEN BULLYING AND SUICIDE ATTEMPTS AMONG U.S. ADOLESCENTS

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Introduction: Suicide is a major public health issue among adolescents in the United States, with rates having more than doubled over the past 15 years. Bullying is a significant risk factor for suicide attempts during adolescence, while sleep insufficiency is concurrently associated with both bullying and suicide attempts. Although joint presence of these exposures may interact to predict suicide attempts, research has not sufficiently investigated whether sleep duration might moderate the association between bullying and suicide attempts.
Methods: This study draws upon data from the 2021 Youth Risk Behavior Surveillance System, comprising a nationally representative sample of 17,134 participants. Multivariable logistic regression was used to evaluate the relationships among bullying (school/electronic), sleep duration, and past-year suicide attempts among adolescents aged 12-18. Covariates included sex, age, race/ethnicity, screen time, and poor mental health. All analyses accounted for complex survey sampling used by the YRBSS.
Results: 15% and 16% of adolescents were bullied at school or electronically, respectively; 10.2% had made ≥ 1 suicide attempt during the past year; 77.3% did not adhere to sleep duration recommendations; and 29.3% reported poor mental health either "most of the time" or "always". In adjusted models, adolescents

who were bullied in school or electronically were three times as likely to attempt suicide vs. those who were not bullied (odds ratio (OR): 3.0, 95% CI:[2.4; 3.7]. Adolescents with ≤4 hours of sleep (10.7%) were twice (OR: 2.6, 95% CI:[1.5; 3.0]) as likely to attempt suicide. Sleep duration significantly moderated the association between bullying in schools and suicide attempts (F5,44=3.1;p=0.019), with those who were bullied showing a higher likelihood of suicide attempts with lower (≤4-6 h) or higher (8-10+h) sleep duration. Those reporting no bullying showed reduced likelihood of suicide attempts as sleep duration increased to 7 hours, and the likelihood remained constant with more hours of sleep. Sleep duration did not moderate this association for electronic bullying.
Conclusion: Bullying (school/electronic) and short sleep duration significantly increase the odds of reported suicide attempts in teenagers. Future research is needed to elucidate why sleep moderates suicide attempts differently among adolescents who are bullied vs. those who are not.
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0814

LIGHT REGULARITY ASSOCIATED WITH COGNITIVE PERFORMANCE IN ADOLESCENTS WITH ADHD

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Introduction: Regular light exposure may play a key role in cognitive performance via both direct (via arousal) and indirect (via circadian rhythm regulation) mechanisms. Adolescents with ADHD are at risk for both cognitive deficits and circadian dysregulation, including delayed and irregular sleep patterns, and light exposure has been proposed as a critical contributor to ADHD-related impairments via its influence on circadian rhythm regulation. However, whether light irregularity contributes to cognitive impairment in adolescents with ADHD, and whether such relationships are mediated by disrupted sleep patterns, is unknown.
Methods: Forty-six adolescents aged 13-17 (54% female) completed a diagnostic interview, >5 days/nights of actigraphy, and a cognitive measure (Kaufman Brief Intelligence Test-Second Edition (KBIT-2): Verbal, Nonverbal, and Composite scores). Twenty were diagnosed with ADHD; 26 were healthy controls (HC). Partial Pearson correlations covarying for sex and age examined associations between the light regularity index (LRI: derived from actigraph-measured light exposure) and KBIT-2 performance in the full sample. We further explored whether LRI-cognition associations were specific to the ADHD group, and if so, whether such relationships were explained by shorter (total sleep time, TST), less regular (sleep regularity index, SRI), and delayed (sleep midpoint) sleep patterns.
Results: In the full sample, lower LRI correlated with poorer composite (r=.34, p=.03) and verbal (r=.42,p=.005), but not nonverbal (r=.08, p=.62), cognitive performance. Adolescents with ADHD displayed lower LRI than HC (β=-.31), and decreased LRI was related to lower SRI (r=.63) and later sleep midpoint (r=-.50) in this group (p's<.05). In the ADHD group, LRI was associated with composite (r=.67) and verbal (r=.70) cognitive performance (p's<.01), and these relationships remained significant in sensitivity analyses controlling for SRI, TST, and sleep midpoint (p's<.05). Associations between LRI and cognition were non-significant in HC (p's>.10).
Conclusion: Irregular light exposure is associated with cognitive deficits among adolescents with ADHD, which is not fully explained by disrupted actigraphy-measured sleep patterns. Future studies using additional behavioral and biological measures of circadian function (e.g., Dim Light Melatonin Onset) may elucidate the specific mechanisms by which light regularity supports cognitive performance among adolescents with ADHD and assess whether regularly-timed light exposure chronotherapy improves cognition in this population.
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0815

A MACHINE LEARNING APPROACH TO IDENTIFY FACTORS ASSOCIATED WITH ADOLESCENT SLEEP OUTCOMES

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Introduction: Beyond natural physiological changes coinciding with puberty, several factors perpetuate poor sleep health in adolescents. However, there is limited research examining their relative importance. This investigation used two popular machine learning approaches to identify the relative significance of key factors associated with multiple sleep outcomes, including bedtime, sleep duration, and social jetlag, in a diverse sample of adolescents.
Methods: Participants were 3,381 adolescents from the age 15 wave (M=15.59, SD=0.76) of the Future of Families and Child Wellbeing Study. Sixty-eight factors spanning child- and parent-reported socio-demographics, neighborhood environment, sleep behaviors, activities, psychopathology, family, school, physical health, and dietary patterns, were identified through literature review and author consensus. Variables were entered into lasso penalized regression (LASSO) and random forest machine learning models for variable selection and establishing the order of factor importance. Self-reported social jetlag (sleep midpoint on weekend nights minus sleep midpoint on school nights) and weekday and weekend bedtime and time in bed were dependent variables.
Results: Factors overlapping between LASSO and random forest in their association with sleep outcomes are reported. Delinquent behavior, peer delinquency, consuming sweet drinks, parent removal of adolescent privileges, and smartphone use near bedtime were associated with greater social jetlag. Irregular bedtime routine, delinquent behavior, and peer delinquency were associated with later weekday bedtime. Consuming breakfast and joint (parent and child) and independent (child) decisions surrounding selecting shows and movies were associated with earlier weekday bedtimes. Delinquent behavior, peer delinquency, and difficulty falling asleep were associated with later weekend bedtimes, while joint (parent and child) and independent (child) decisions surrounding selecting shows and movies were associated with earlier weekend bedtimes. Consuming breakfast more days was associated with longer weekday time in bed, while irregular bedtime routine, peer delinquency, parent verbal aggression, difficulty falling asleep, and smartphone use

near bedtime were associated with shorter weekday time in bed. Delinquent behavior was associated with shorter weekend time in bed.
Conclusion: Across both approaches, the most consistent findings draw attention to delinquent behavior, bedtime routine regularity, smartphone use, and difficulty falling asleep as targets to optimize adolescent sleep health. Findings have implications for clinical and policy recommendations.
Support (if any):

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0816
INFANT BEDTIME AND BEDTIME VARIABILITY ARE INDEPENDENTLY ASSOCIATED WITH TOTAL SLEEP DURATION

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Introduction: Sleep-related behaviors in the realm of pediatrics encompass elements that facilitate sleep, such as a regular sleep schedule, following a bedtime routine, and positive parent-child interactions before bedtime. Several studies have shown a positive association between an early bedtime, consistent routines and parent-infant interaction promoting infant independence in falling asleep with longer sleep duration and less night awakenings. Nonetheless, few studies have investigated bedtime regularity. Thus, we examined the relationships among infants' bedtime, bedtime regularity, total sleep time, night awakenings and sleep latency in infants over the course of one month, utilizing subjective and objective sleep data
Methods: We recruited 253 infants 4-11 months old (mean 6.7±2months), 46% males. Parents completed surveys on socio-demographic information and the Brief Infant Sleep Questionnaire-Revised (BISQ-R). Objective sleep measures including average bedtime (BT), total sleep time (TST), number of night awakenings (NA) and the standard deviation for bedtime (BTV), were collected for one month using Nanit auto-videosomography (mean 24±5.3nights). Linear and logistic regressions modeled the relationship between BT and BTV as predictors of objective metrics of TST and NA and sleep latency collected from the BISQ-R. Infant's sex and age were included as covariates.
Results: Compared to a BTV of 15minutes or less, a BTV of 45minutes to 1 hour was associated with a TST shorter by 28.0±10.2minutes, and a BTV of more than 1hour to TST shorter by 33.5±11.8min. Compared to a BT before 7pm, later BT was associated with a shorter TST. Specifically, TST was 19.7±10 min ($p=0.03$) less when BT was between 7-8PM, 63.8±10.0 min ($p< 0.001$) less for BT at 8-9PM, and 126.4±12.7 min ($p< 0.001$) less when BT was after 9PM. NA were not associated with BT or BTV. BT was associated with sleep latency, with infants going to bed after 9pm being more likely to take more than 16 min to fall asleep compared to infants going to bed before 7pm (OR 9.9 CI 1.22-80.4,$p=0.03$).
Conclusion: Higher BTV and BT after 7PM were independently associated with shorter TST in infants. These results provide important information for clinical practice and further work should explore how to incorporate this information in sleep interventions.
Support (if any):

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0817
INFLUENCING FACTORS IN THE DECISION-MAKING PROCESS OF U.S. PARENTS REGARDING THE USE OF MELATONIN FOR CHILDREN

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Introduction: Parents are increasingly turning to exogenous melatonin to help children sleep, despite a lack of experimental research examining its efficacy and the safety of long-term use. In the U.S., melatonin is classified as a dietary supplement and no prescription is needed to obtain it. Given recent surges in pediatric consumption, current data on the factors contributing to parents' decisions to administer melatonin to their children are vital in order to understand perceptions and concerns surrounding its use.
Methods: Parents of 1039 U.S. children ages 1.0-13.9 years completed an online questionnaire on children's development, sleep health, and melatonin use. Data on 212 children who either took melatonin in the past 30 days (N = 131) or at some point previously (N = 81) were included in the present analysis. Open-ended questions on why parents administered melatonin and why they stopped (if applicable) were categorized through thematic coding.
Results: Although nearly half of children who recently took melatonin had bedtime resistance (51.1%) or difficulty falling asleep (46.2%), 24.4% had no reported behavioral sleep problems. Parents' most common reasons for giving melatonin were to help children fall asleep (49.3%) or wind down before bedtime (22.7%). Parents also reported administering it to adjust for changes to regular sleep routines (17.5%) or to shift circadian rhythms (11.4%). Parents frequently reported initiating melatonin on their own (50.0%), with less than half following the recommendation of a healthcare provider (48.1%). Parents often stopped giving melatonin when they felt their child didn't need it anymore (32.0%). Fewer parents discontinued use due to negative side effects (9.3%) or concerns about health and safety (13.3%).
Conclusion: Parents reported giving their child melatonin for a variety of reasons related to sleep and circadian timing. Melatonin use was frequently initiated without the recommendation of a medical professional, which raises concerns about misinformation given the gaps in scientific research and variable quality of over-the-counter supplements. Greater research and wider dissemination of guidelines are needed to support parents in making informed decisions regarding their child's melatonin use.
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0818
ROOM-SHARING AND BED-SHARING: REASONS, BELIEFS, AND SLEEP IN MOTHERS AND TODDLERS FROM MEXICAN AMERICAN FAMILIES

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Introduction: Sleep is essential for development, yet best practices in pediatric sleep are based on studies of primarily non-Latino White families, where rates of room-sharing, bed-sharing, and feeding to sleep are relatively low in toddlers. This ongoing study characterizes room-sharing and bed-sharing reasons, beliefs, practices, and sleep among mothers and toddlers in Mexican American families.
Methods: 51 Mexican American mothers (19-43 years; mean education 12.3 + 3.2 years) of toddlers (77% boys; 12-15 months) completed surveys in Spanish (67%) or English. Mothers and toddlers wore an actigraph for 7 nights. Surveys included Bed-sharing and Room-sharing Beliefs (poor parent sleep, poor child sleep, child dependent on parent for sleep, parent preference to have child nearby) and the Brief Infant Sleep Questionnaire (sleep ecology, room-sharing reasons, sleep-related practices).
Results: Room-sharing was common (88%), with room-sharing reasons including parental preference to have child nearby (PREF, 53%), space/logistics (SPACE, 33%), and child needing parent to sleep (NEED, 13%). All NEED mothers reported bed-sharing with their toddler, with 50% of PREF and 47% of SPACE mothers reporting bed-sharing. SPACE mothers agreed that bed-sharing contributed to poor parent and child sleep more than PREF or NEED mothers (medium effect size). PREF mothers disagreed that bed-sharing made a child depend on parent for sleep more than the other groups (large effect size). Toddlers falling asleep at bedtime while feeding was common among all room-sharing mothers (SPACE=67%, PREF=88%, NEED=100%), although higher in bed-sharing families (96% vs. 65% own bed). Parent sleep timing (midpoint) was delayed 48 minutes for SPACE mothers vs. NEED mothers, while child sleep timing was 30 minutes delayed in bed-sharing toddlers and 54 minutes delayed in toddlers who fell asleep feeding. Toddlers who fell asleep feeding had a 35 minute longer sleep opportunity, but a 33 minute shorter sleep duration than non-feeding toddlers.
Conclusion: Early findings from our ongoing study of sleep in mothers and toddlers from Mexican American families suggest sleep ecology beliefs and practices differ from findings in U.S. non-Latino White families. Findings highlight the importance of cultural and ecological sensitivity when designing interventions to reduce sleep disparities and improve overall toddler health.
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0819

CULTURAL ADAPTATION AND PRELIMINARY EFFICACY TESTING OF A SLEEP INTERVENTION (SIESTA) FOR URBAN LATINO CHILDREN

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Introduction: Latino children living in urban areas face disproportionate exposure to contextual and cultural stressors that can challenge optimal sleep. School Intervention to Enhance Latino Students' Time Asleep (SIESTA) is a tailored intervention to improve sleep hygiene and duration in Latino middle school students in the U.S. and Puerto Rico.
Methods: Using Barrera and colleagues' five stages of cultural adaptation, we identified intervention elements to retain, set refinement goals, and gathered information (literature review, focus groups/interviews, school feedback). Stage 2 involved expert review and integrating information from Stage 1. Stage 3 included an open trial to assess the content and acceptability of the adaptation. Stage 4 involved integration of feedback from the open trial. In Stage 5 (pilot RCT), Latino children (ages 11-13, n=34) and their caregivers were recruited from urban middle schools in Greater Providence and San Juan. Children were randomized to the SIESTA or control condition. SIESTA participants received a virtual group intervention (four sessions about sleep hygiene, duration, environment) and two caregiver-child sessions (sleep environment assessment, goal setting, feedback from daily sleep monitoring). Control participants received basic sleep and health education (equivalent contact time). All participants completed baseline, end-of-treatment (EOT), and 4-month follow-up assessments.
Results: We identified themes about sleep values and beliefs, urban stressors disrupting sleep (e.g., noise, crowding), and barriers to engagement. Each component was tailored based on experiences relevant to many urban Latino families. SIESTA participants reported high acceptability. Sleep duration measured via actigraphy increased by 13.3% (M=45min; d=0.16) in SIESTA participants vs. 7.2% (M=25min; d=0.14) in controls from baseline to EOT, p=.04. Differences were greater at 4-months (15% increase in SIESTA, 1% in controls). Caregiver- and child-reported sleep disturbances significantly decreased from baseline to EOT and to follow-up for SIESTA vs. controls (p's<.04). Caregiver- and child-reported sleep hygiene improved significantly for SIESTA vs. controls from baseline to EOT and to follow-up (p's<.05).
Conclusion: A rigorous, multi-method approach allowed for tailoring of an innovative intervention to address the sleep needs of urban Latino children. SIESTA shows potential to improve sleep duration and hygiene in this population. A large-scale RCT will evaluate effectiveness and implementation.
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0820

CHALLENGES TO PEDIATRIC PATIENTS SLEEPING WELL IN THE HOSPITAL: ENVIRONMENTAL AND PRACTICE CONSIDERATIONS

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Introduction: Pediatric oncology and bone marrow transplant (BMT) patients frequently experience poor sleep during their extended hospital stays due to various sleep disruptors. This study aimed to identify specific factors affecting the sleep of our hospitalized patients.
Methods: Hospitalized BMT / oncology patients aged ≥5 years old (n=25) and their parents completed a survey designed for this study, which involved describing the extent to which factors identified in prior studies / extant literature were barriers or facilitators to patient sleep. Over 5 consecutive days / nights, we measured the light that patients were exposed to and how frequently staff entered patient rooms during the night. Light intensity (lux) was collected via Condor ActTrust actigraphs

installed at eye-level by the patient's bed. Room entries were tracked via paper / pencil logs affixed to the door.
Results: Participants (median age of 11.2 years) most frequently endorsed barriers related to vital sign checks, room entries, loud sounds, bright lights, medical procedures, and pain. Top sleep facilitators included reducing light in the room, pain / sleep medications, and having family nearby. Average light exposure varied over the course of the day: morning (median = 2.34 lux, range = 0.09-22.17), daytime (median = 15.55 lux, range = 3.49-125.63), evening (median = 10.48 lux, range = 2.64-64.82), and overnight (median = 1.03 lux, range = 0.28-9.44). Staff-recorded room entries averaged 5 per night, with one patient experiencing 18 room entries in a single night.
Conclusion: Participants endorsed numerous barriers to getting good quality sleep while hospitalized. Based on both patient / family-report as well as objective measurements, it is evident that staff room entries and bright lights at night are not conducive to sleep. Light levels in patient rooms were routinely too dim during the day to optimally support circadian rhythm entrainment. Given that sleep plays a crucial role in health maintenance and recovery, hospitals should strive to reduce staff-related sleep disturbances where possible and optimize lighting in patient rooms. These efforts would create a more "sleep friendly" environment for both patients and their resident family members.
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0821

GPS-DERIVED GREEN SPACE EXPOSURE AND SLEEP AMONG ELEMENTARY SCHOOL CHILDREN

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Introduction: Exposure to greenspace has been linked to improved well-being among children such as cognitive restoration and reduced stress. Greenspace is also associated with increased exposure to light, a zeitgeber of the circadian system. Studies examining the association between greenspace exposure and sleep, however, have been equivocal, largely due to methodology related to static measures of environmental context. We address this issue by using GPS-derived measures of greenspace that move beyond static residential contexts, and examine multiple measures of access to greenspace.
Methods: Schoolchildren in grades 1-3 in the ongoing Project Greenspace, Sleep, and Mental Health (G-SPACE) study in Rhode Island were recruited to wear a GPS and an accelerometer for seven days. GPS was used to identify stay points if participants spent 15 minutes in a space. We extracted and averaged Normalized Difference Vegetation Index (NDVI) values in 100m, 200m, 300m, 500m, and 1,000m circular buffers surrounding each participant's stay points to calculate greenspace exposure. Sleep measures were derived using actigraphy, and potential association with greenspace exposure was analyzed using a series of linear regression models.
Results: Forty-nine participants had 398 valid days of wear-time. On average, participants wore devices for 6.2 days (SD=1.72). The mean sleep values included: Time in Bed, 9.63 hours; Total Sleep Time, 9.17 hours; Sleep Efficiency, 88.78%, and Wake After Sleep Onset (WASO), 37 minutes). Both TIB (hours) (100m β:1.98, p=0.01; 200m β: 1.87, p=0.01; and 300m β: 1.65, p=0.05) and TST (hours) (100m β: 1.94, p=0.01; 200m β:1.67, p=0.01; and 300m β: 1.37, p=0.05) showed positive associations with mean NDVI across smaller buffer distances. However, associations between Sleep Efficiency, WASO and greenspace exposure were not significant.
Conclusion: GPS-derived greenspace exposures in close proximity to daily activities are associated with total sleep time among elementary school children, with the strength of the association diminishing with each widening radius from the stay point. Our results have implications for urban planning and greening of neighborhoods, but additional analyses are needed with larger sample sizes and control for sociodemographic factors.
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0822

THE 3-30-300 RULE FOR GREEN SPACE EXPOSURE AND SLEEP IN ELEMENTARY SCHOOL CHILDREN

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Introduction: In 2015, the United Nations identified a target of "universal access to safe, inclusive and accessible, green and public spaces "to be implemented by 2030. However, few guidelines exist to equitably increase access to the health-promoting qualities of high-quality green space. Recently, the "3-30-300" rule was introduced as a benchmark to ensure universal access to green space. This study aimed to use the 3-30-300 benchmark for green space exposure, to determine whether these metrics are associated with sleep phenotypes in elementary school children.
Methods: Elementary school children in grades 1-3 in the ongoing Project Greenspace, Sleep, and Mental Health (G-SPACE) study in Rhode Island were recruited to wear a GPS and an accelerometer for seven days. The 3-30-300 rule was applied to their residential address. '3' was quantified using the Green View Index (GVI), derived from the panoramic street view from Google. '30' refers to a minimum 30% tree canopy within a 200m buffer of the home;'300' is based on home distance to ≥50m² greenspace within 300m. The association between the mean greenspace measurements and sleep measures, Total Sleep Time (TST, hours), Sleep Efficiency (SEF), and Wake After Sleep Onset (WASO, minutes) was analyzed using T-tests.
Results: There is no statistically significant difference between viewing more than three trees versus less (TST mean 9.19 vs 8.95, SEF mean 88.5% vs 87.9%, and WASO mean: 37.8 vs. 39.6); having ≥ 30% tree canopy versus less (TST mean: 9.16 vs 9.01, SEF

mean 88.1% vs 88.2%, and WASO mean: 38.4 vs 39); and having 50m2 greenspace within 300m versus without (TST mean: 8.94 vs 9.18, SEF mean 88.3% vs 88.2%, and WASO mean: 38.5 vs 38.8).
Conclusion: Participants that met the benchmarks for the 3-30-300 rule did not have better sleep measures compared to those that did not. Due to the multifactorial nature of sleep, this benchmark may not capture the contextually relevant locations that may influence sleep health profiles among children.
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0823
ASSOCIATIONS BETWEEN PARENTAL ANXIETY, PSYCHOLOGICAL DISTRESS, AND INFANT SLEEP DIFFICULTIES

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Introduction: Insufficient sleep in infancy is linked with deleterious health outcomes, encompassing compromised brain development, learning, mental functioning, and emotional states. Whether parents' emotional symptoms influence infant sleep has not been examined at the national level comprehensively. To explore this question observationally, we investigated associations between parental emotional symptoms and disturbances in infant sleep patterns.
Methods: This study utilized data from the National Health Interview Survey encompassing 447 mothers and 304 fathers and their infants (0-1 year; n=751) to examine associations among maternal and paternal anxiety, psychological distress, and infant sleep disturbances. Parents used the Baby Pediatric Symptom Checklist to report their infant sleep symptoms (troubles falling asleep: "Is it hard to put your child to sleep?" and staying asleep: "Does your child have trouble staying asleep?", with responses "not at all" (N), "somewhat" (S), "very much" (V). Predictors included maternal and paternal anxiety levels, gauged by frequency of feelings of worry, nervousness, or anxiety. Psychological distress was measured using the Kessler-6 scale. Multi-group generalized structural equation modeling was employed. Covariates were: age, sex, race/ethnicity (parent/infant), marital status, education, employment, nativity, poverty level, number of children and adults in household, and chronic health conditions (parent).
Results: Endorsement rates for trouble falling asleep were: N=79.6%, S=17.6%, and V=3.4%, and for trouble staying asleep: N=84.5%, S=13.4%, and V=2.1%. Compared with mothers who never experienced anxiety, mothers who reported anxiety a few times a year or weekly were 3.0 and 4.0 times as likely to report their infant having trouble falling asleep. Mothers experiencing anxiety a few times a year, monthly, or weekly, were 3.5, 5.0, and 5.2 times as likely to report their infant having trouble staying asleep. These associations were not evident among fathers. No associations were identified between maternal or paternal psychological distress and difficulties in infant sleep initiation or maintenance.
Conclusion: Results from this study align with previous clinical research showing differential associations between infant sleep and maternal and paternal mental health symptoms. Future work is needed to better understand why these differences exist in anxiety and to elucidate why psychological distress was not linked with infant sleep.
Support (if any): COBRE Award P20GM139743

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0824
THE ASSOCIATION BETWEEN SLEEPING ARRANGEMENTS AND BREASTFEEDING DURATION

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Introduction: The World Health Organization recommends that infants be exclusively breastfed for at least the first 6 months of life, and then partially breastfed until 2 years of age and onward, if preferred. However, the choice to breastfeed an infant is influenced by cultural, biological, and social factors. For instance, factors which may promote breastfeeding include bedsharing, but the current literature requires more longitudinal examinations and follow-ups. The current project aims to investigate the associations between bedsharing at 6 months and the duration of breastfeeding.
Methods: The analysis included data from 294 mother-infant dyads (52 bedshared) from the Maternal Adversity, Vulnerability and Neurodevelopment cohort. Maternal reports of their infant's sleep location were reported at 6 months of infancy. Infants who shared a bed with their mother were considered to bedshare, whereas those who slept in the same room as their mother, in their own room alone, or in their own room with someone else where not considered to bedshare. A retroactive measure of breastfeeding was given to mothers (until infants were 24 months), in which they were asked how old the infant was when they stopped breastfeeding. An independent samples t-test was conducted to compare breastfeeding duration between infants who bedshare and those who do not.
Results: Bedsharing infants were breastfed for a longer period (in months; M=12.87, SD=5.21) than infants who did not bedshare (M=10.64, SD=3.97; t(292)=-3.48, p=<.001).
Conclusion: These results show that infants who bedshare with their mother are likely to be breastfed for about 2 months more. These results provide support for the protective nature of bedsharing at 6 months on breastfeeding duration. Given these potential benefits, these results highlight the need for clear recommendations for parents to safely practice bed sharing if they are willing to use this sleeping arrangement.
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0825
SWEET DREAMS ARE MADE OF THIS: IMPROVING THE FAMILY BOND WITH BETTER SLEEP FOR CHILDREN 6 MONTHS TO 6 YEARS OLD

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Introduction: This comprehensive review explores methods employed to improve pediatric sleep, emphasizing developmental trends, challenges, and health impacts. The narrative navigates through behavioral modification techniques, responsive parenting, and innovative digital therapeutic interventions, offering a holistic perspective on pediatric sleep dynamics. The primary objective is to evaluate the efficacy of responsive parenting techniques within the Batelle Sleep School program in improving pediatric sleep patterns and enhancing overall family well-being. This study aims to contribute evidence-based insights into the complex interplay between sleep quality, parenting styles, and child development.
Methods: The study involves a retrospective analysis of surveys from under 500 families with children aged six months to six years enrolled in the Batelle Sleep School program from October 2022 to March 2023. Quantitative and qualitative data will focus on sleep assessments, parental confidence, sleep latency, and awakening surveys. The intervention spans two weeks, during which parents follow the program's guidelines.
Results: Pre-program and post-program data will be analyzed to assess changes in sleep latency and the number of awakenings. Statistical methods, including paired t-tests, will be employed for quantitative analysis, while qualitative data will undergo thematic analysis to identify common themes related to family dynamics and program effectiveness.
Conclusion: This research aims to provide evidence-based recommendations for parents, healthcare professionals, and researchers by investigating the integration of responsive parenting techniques with a digital therapeutic in the context of the Batelle Sleep School program. Bridging the gap between pediatric sleep challenges and effective interventions, this study contributes to the evolving landscape of sleep medicine, recognizing the diverse needs of families and offering tailored solutions for improved pediatric sleep.
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0826

SLEEP IN PARENTS AND CHILDREN WITH OVERWEIGHT AND OBESITY

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Introduction: Sleep is fundamental for overall health and well-being. Nevertheless, a substantial portion of school-age children, ranging from 30.0% to 43.7%, experience sleep disturbances as reported by their parents. Children who are overweight or obese have increased sleep disturbances than their normal-weight peers. Research on children and parent's sleep shows that parental sleep and health characteristics may serve as a risk or protective factor for children's sleep. This study aims to investigate the sleep patterns of parents and their school-age children with overweight and obesity.
Methods: Children (6-9 years) with overweight and obesity wore a wrist-worn actigraph for 7 days. Children's sleep disturbance was assessed using the parent-report Children's Sleep Habits Questionnaire (CSHQ). Parental subjective sleep quality was assessed using the Pittsburgh Sleep Quality Index (PSQI), with parental depressive symptoms measured using the Epidemiologic Studies-Depression Scale (CES-D). General linear models were used to examine the association between parental and child sleep.
Results: Overall, 246 children and parents participated in this study, with 208 (84.6%) children experiencing clinically significant sleep disturbances and 123 (50%) parents reporting poor sleep quality. Higher children's sleep disturbance scores significantly predicted poorer parental sleep quality ($b = 0.11$, $p < .01$). Poorer parental sleep quality was associated with more severe sleep disturbances in children ($b = 0.46$, $p < .01$). This association was unaffected by children's actigraphic sleep (all $p > .05$) and remained significant after adjusting for parental depressive symptoms ($b = 0.14$, $p < .01$).
Conclusion: Sleep disturbances are prevalent in both parents and their school-age children who are overweight or obese, with a significant bi-directional association between the two. Healthcare professionals working in school settings should screen for sleep disturbances in parent-child dyads of children with overweight and obesity.
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0827

SLEEP-RELATED IMPAIRMENT AND COGNITIVE FUNCTION AMONG HISPANIC AND NON-HISPANIC CHILDREN IN RHODE ISLAND

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Introduction: Racially minoritized groups disproportionately experience poor sleep health profiles that increase the risk of long-term cognitive decline. Notably, disparities in sleep health are observed in childhood, where unfavorable sleep-wake patterns have been linked to cognitive impairments such as deficits in memory and attention. Nonetheless, limited studies exist examining sleep-related impairment on cognitive function among racially minoritized children in the United States. We aim to explore the association between sleep-related impairment (e.g., perception of waking alertness, sleepiness, and function) and cognitive function among a diverse sample of Rhode Island children.
Methods: A sample of elementary school children in grades 1-3 was taken from the ongoing Project Greenspace, Sleep, and Mental Health (G-SPACE) study in Rhode Island.

Sleep-related impairment and cognitive function were assessed using PROMIS® Parent Proxy Scales. Multiple linear regression models were used to estimate associations between sleep-related impairment and cognitive function in the aggregate sample and then stratified by ethnicity (i.e., Hispanic and non-Hispanic) while controlling for actigraphy-derived sleep duration, age, gender, and income.
Results: The final sample (N=76) included 43 (57%) non-Hispanic and 33 (43%) Hispanic children. Seventy-four percent of the non-Hispanic children identified as White. Girls accounted for 60% (N=46) of the sample, with 26 (34%) and 20 (26%) being non-Hispanic and Hispanic females, respectively. The mean ages were 7.58 (SD=1.03) and 7.66 (SD=0.89) for non-Hispanic and Hispanic children. Adjusted analysis showed a negative association between sleep-related impairment and cognitive function in non-Hispanic children (β= - 0.52, 95% CI= -0.84, -0.21, p< 0.01), but no significant association was found in the Hispanic subgroup (β= - 0.06, 95% CI= -0.60, -0.47, p= 0.82).
Conclusion: Our findings suggest a negative relationship between sleep-related impairment and cognitive function among non-Hispanic children. However, no significant association was observed among Hispanics, suggesting ethnicity may serve as a moderator of the association between sleep-related impairment and cognitive performance. Limitations include a small sample size and less diversity in the Hispanic subgroup. Future analyses will include a larger and more diverse sample size and other factors, including sleep-related breathing disorders, and access to greenspace.
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0828

INVESTIGATION OF SLEEP DISTURBANCES IN PEDIATRIC PATIENTS WITH SEPTO-OPTIC DYSPLASIA

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Introduction: Septo-optic dysplasia (SOD) is a heterogenous neurodevelopmental condition diagnosed based on the presence of two or more of the following findings: optic nerve hypoplasia, absence of the septum pellucidum, dysgenesis of the corpus callosum, and pituitary hormone abnormalities. Sleep disturbances in SOD are common, however, they have not been well characterized. This study aims to investigate and characterize sleep disturbances in SOD.
Methods: We used the Slicer-Dicer tool to identify pediatric patients (< 21 years) from EPIC with a diagnosis of SOD (ICD Q04.4) who had encounters between July 2013 and July 2023 at Norton Children's Hospital, KY, USA.
Results: We identified 35 patients (M:F=12:23) with SOD. The mean age was 9.5 years (SD:4.5). Twenty-six patients described a sleep disturbance including snoring (n=5), insomnia (n=8), and frequent arousals (n=5). Of those, ten patients had previous polysomnography (PSG) at a mean age of 4.5 years (SD:3.3). For those who underwent PSG, the mean total sleep time was 381.3 minutes (SD:75.8); the median sleep latency was 14.0 minutes (SD:34.1); four patients had a prolonged sleep latency of > 20 minutes (IQR:5.1-70.9); the mean sleep efficiency was 70.7% (SD: 26.9); the median percentage of N1 sleep was 0.15 % (IQR:0-0.6), N2 42.9% (IQR:35.3-49.9), N3 38.1% (IQR: 25.1-43.4), REM 21.8% (IQR:16.1-28.2). Four patients had an elevated arousal index of > 10. The mean AHI was 8.2 (SD:11.6). No patients had central apnea or elevated periodic limb movements. Of the 35 patients, eight had obstructive sleep apnea and seven used medications, such as melatonin, to assist with sleep.
Conclusion: Patients with SOD have fragmented sleep and are at increased risk of obstructive sleep apnea. The presence of sleep disturbances in patients with SOD is likely multifactorial. Many patients with SOD have midline brain defects and midline areas that regulate sleep such as the suprachiasmatic nucleus (SCN) of the hypothalamus and the pineal gland may be impacted by their condition.
Support (if any):

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0829

EFFECTS OF SEX ON SLEEP EEG IN TYPICAL AND ATYPICAL NEURODEVELOPMENT

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Introduction: Sleep electroencephalography (EEG) patterns exhibit intricate variations influenced by multiple factors, including sex-specific disparities. While sex effects in sleep neurophysiology are relatively well-described in adults, information is more limited in pediatric samples, even less so in specific cohorts such as neurodevelopmental disorders (NDD). In this study we aimed to describe sex differences in a comprehensive set of EEG-derived sleep features in non-NDD individuals and compare those to the NDD cohorts including autism spectrum disorder(ASD), attention deficit hyperactivity disorder(ADHD), and intellectual disabilities(ID).
Methods: We used whole-night polysomnography data from a large National Sleep Research Resource sample, spanning from 2.5 to 17.5 years and Nationwide Children's Hospital Sleep Databank, a pediatric sleep clinic cohort. Using ICD codes, we have defined the NDD subsets for ASD (N=196), ADHD (N=525), intellectual disabilities (N=167), and no-NDD sample (N=1523). The open-source package Luna was used to derive multiple sleep features including sleep spindles, slow oscillations (SOs) and spectral power across standard frequency bands. Linear regression models controlling for age were used to investigate sex effects with standardized b-coefficients (bstd) and p-values reported.
Results: Almost half of sleep EEG features expressed nominally significant sex differences in the no-NDD cohort (165 out of 351 tested EEG metrics), although their effect sizes were rather small. The strongest sex differences were observed in fast spindle density across all channels (largest effect at C4, bstd=-0.22,p=7x10-6 at C3, higher in girls), SO duration across all channels (largest effect at F3, bstd=0.24,p=1x10-5, longer in boys), occipital spectral power in alpha and sigma bands during REM sleep (bstd=-0.23,p=7x10-6 at O1, higher in girls). Generally, the NDD groups expressed similar pattern of sex differences evidenced by significant correlation between the standardized beta coefficients of each disorder and no-NDD group across all metrics (Pearson's r=0.32 in ASD, 0.34 in ADHD and 0.27 in ID) although we also found evidence of disorder-specific sex differences.
Conclusion: Our findings indicate that multiple sleep EEG metrics express significant sex differences in childhood which are also observed in NDD populations. Such sex differences could

potentially relate to disorder-relevant factors such as the differential prevalence of sleep issues in boys and girls or symptom manifestation.
Support (if any):

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0830
POLYSOMNOGRAPHY DIFFERENCES IN CHILDREN WITH AND WITHOUT HYPERTENSION IN THE ABSENCE OF OSA

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Introduction: There is growing evidence linking hypertension and sleep disturbances in adults, even in the absence of OSA. Even though hypertension is associated with OSA in children, there is a lack of data on influence of the non-respiratory parameters of sleep on hypertension. The objective of this study is to compare respiratory and non-respiratory sleep parameters in children with and without hypertension, among those without OSA based on PSG.
Methods: IRB approved retrospective chart review of patients ages 8-17 years, who underwent PSG at Nemours Children's Hospital, DE, between January 2020 and May 2023. Data was collected on demographics, anthropometrics, comorbid medical conditions, and PSG findings from EMR. Hypertension was defined as an average systolic (SBP) and/or diastolic blood pressure (DBP) ≥ 95th percentile for gender, age, and height based on AAP Clinical Practice Guidelines. An average of 5 BP measurements from clinic visits within year prior to the date of the PSG were analyzed. Height percentiles were calculated using CDC guidelines. Descriptive and comparative statistics were performed to compare PSG findings between non-hypertensive and hypertensive youth.
Results: We collected data on 228 children. The cohort (n=228) was split into non-OSA and OSA groups based on PSG results. Among the non-OSA group (n=108), 22 individuals were categorized as hypertensive (20.3%). Mean age was 11.4 years and mean BMI z-score was 2.7 (1.83) among the hypertensive group and 12.6 years and 1.12 (2.04) respectively among the non-hypertensive group, with a significant difference in BMI z-score ($p< 0.001$). Respiratory and non-respiratory sleep parameters were similar, except average heart rate during sleep was significantly higher in the hypertensive group; 79.3 BPM (±11.34) vs 70.9 BPM (±10.07) for the non-hypertensive group ($p = 0.002$).
Conclusion: In children without OSA, there were no observed differences in respiratory or non-respiratory parameters between the hypertensive and non-hypertensive groups. Children in hypertensive group had a significantly higher BMI Z-score and average heart rate during sleep. This may suggest that obesity and sympathetic activation are important in the pathogenesis of pediatric hypertension even in the absence of detectable sleep disorders. Future studies with larger cohorts are necessary to further explore these relationships.
Support (if any):

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0831
GRAND CONNECTIONS: INTER- AND INTRAINDIVIDUAL SLEEP BETWEEN GRANDPARENTS RAISING GRANDCHILDREN AND GRANDCHILDREN

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Introduction: Grandparents raising grandchildren (GRG) report greater global sleep problems and sleep disturbances than non-caregiving grandparents. Moreover, 70% of grandchildren being raised by their grandparents sleep shorter or longer than recommended. However, no studies examined the daily relationship (intraindividual) or average (interindividual) relationship between GRG/grandchild sleep. We examined daily and average GRG and grandchild sleep associations.
Methods: Co-residing GRG (N=24, Mage=58.41, 66.7% female; 63% primary grandchild caregiver) completed daily sleep diaries for themselves/their grandchildren (Mage=8.19, 33.4% female). Grandparent/grandchild variables included sleep onset latency-SOL, wake after sleep onset-WASO, and total sleep time-TST. Multi-level models (Rv4.2.2) examined grandchild and grandparent sleep associations, controlling for grandparent and grandchild age.
Results: Daily grandchild sleep was positively associated with daily grandparent sleep for SOL ($t(276)=5.75$, $p<.001$), WASO ($t(276)=7.71$, $p<.001$), and TST ($t(276)=5.68$, $p<.001$). Daily grandparent sleep was positively associated with daily grandchild sleep for SOL ($t(276)=5.74$, $p<.001$), WASO ($t(276)=7.71$, $p<.001$), and TST ($t(276)=5.68$, $p<.001$). Average grandchild sleep was positively associated with average grandparent sleep for SOL ($t(23)=2.31$, $p=.030$) and WASO, ($t(23)=8.31$, $p<.001$). Average grandparent sleep was positively associated with average grandchild sleep for SOL ($t(23)=2.36$, $p=.027$) and WASO ($t(23)=8.26$, $p<.001$).
Conclusion: Analyses suggest a bidirectional relationship between GRG and grandchild sleep. Because over half of all GRGs coparent children with one or more family members, family-level analyses may help clarify sleep associations. Given that grandparents in this study reported on both their own and the child's sleep, longitudinal/multi-method studies are needed to determine causality. It remains to be determined whether improving grandchild sleep may improve grandparent sleep (and vice versa), or if dyadic intervention is needed.
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0832
HYPERTENSION IN PEDIATRIC PATIENTS WITHOUT OBSTRUCTIVE SLEEP APNEA (OSA)

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Introduction: Studies show that sleep disturbances are associated with adult hypertension. The relationship between OSA and hypertension has been extensively studied, however, is understudied in pediatric patients without OSA. The aim of this study was to identify socioeconomic factors, social determinants, and medical co-morbidities associated with hypertension in pediatric patients without OSA based on polysomnography (PSG).
Methods: IRB-approved retrospective chart review of patients who underwent PSG at Nemours Children's Hospital, DE between January 2020 and July 2023. Eligibility criteria included children 8-17 years, completed PSG, and office visit blood pressure (BP) recordings. Anthropometrics, demographics, and socioeconomic, social determinants, and medical history obtained from EMR. Those without OSA based on PSG were divided into hypertensive and non-hypertensive groups. Hypertension was defined as the average (5 BP measurements from clinic visits within a year from PSG) systolic blood pressure (SBP) and/or diastolic blood pressure (DBP) that is ≥95th percentile for gender, age, and height based on AAP Clinical Practice Guidelines. Height percentiles were calculated using CDC guidelines. Descriptive and comparative statistics were performed to compare the two groups. Data is reported as mean ± SD, non-hypertensive vs. hypertensive. Frequency of categorical data is reported in parentheses for the hypertensive group.
Results: Of the 228 patients, 108 did not meet criteria for OSA based on AHI>2 and were excluded from the analysis (47.3%). Of the 108 without OSA, 22 were hypertensive (20.3%). All 22 had SBP ≥95th percentile; two had both SBP and DBP ≥95th percentile. Significant differences between hypertensives and non-hypertensives were in race (p=0.037, higher frequency of blacks), parents in household (p=0.042, lower frequency in those with both parents in the household), diabetes (p= 0.047, higher frequency of type 2 diabetes), and mental illness (p=0.027, higher frequency of autism and mood disorders). Daytime HR (96.2 ±12.4 vs 87.1±12.2, p=0.003), and BMI (2.7± 2.0 vs 1.1±1.8, (p< 0.001) were both significantly higher in the hypertensive group.
Conclusion: In pediatric patients without OSA, there are multiple factors and co-morbidities associated with hypertension. Future larger studies are necessary to establish these associations and relationships in non-OSA patients.
Support (if any):

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0833

IDENTIFYING CLINICAL DETERMINANTS OF OBSTRUCTIVE SLEEP APNEA IN CHILDREN WITH SICKLE CELL DISEASE

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Introduction: Children with sickle cell disease (SCD) are at increased risk for obstructive sleep apnea (OSA). Guidelines recommend screening for OSA in this population based on clinical assessment. Several aspects of OSA in children with SCD remain poorly understood, such as clinical characteristics and the optimal approach for screening. Although polysomnography (PSG) proves valuable for diagnosing individuals who exhibit signs and symptoms of OSA, its cost-effectiveness as a screening tool for asymptomatic children with SCD remains uncertain. There is a need for an effective clinical screening approach for OSA in this population. The objective is to compare the clinical characteristics of children with SCD who had OSA (AHI >1) against those who did not on PSG.
Methods: All SCD patients aged 2 to 18 between March 2016 to May 2023 attending the Comprehensive Sickle Cell Center who underwent PSG were retrospectively compared with sleep apnea symptoms during clinic visits. Symptoms criteria were retrieved from clinical encounters for snoring, apnea, mouth breathing, gasping, enuresis in children older than ten, morning headache, hyperactivity, daytime sleepiness, and daytime naps.
Results: From 180 children with SCD who attended the clinic, 56 patients (31.1%) had a PSG performed, whereby 37.5% (n=21) were diagnosed with OSA, and 62.5% (n=35) did not have OSA. In children with OSA, 80.9% (n=17) reported snoring, 23% (n=5) mouth breathing, and 4.7% (n=1) witnessed apnea. From the group without OSA, 40% (n=14) had no symptoms, 42% (n=14) reported snoring, 20% (n=7) mouth breathing, 17.1% (n=6) reported taking naps, 14.2% (n=5) gasping. Despite being the most frequent symptom to occur in those with and without OSA, habitual snoring was significantly higher in the OSA group (p= 0.02). Conversely, in the absence of symptoms, patients were unlikely to have OSA (p=0.003).
Conclusion: In children with SCD, the absence of symptoms suggests OSA is not present; therefore, PSG may not be warranted. However, the presence of habitual snoring may be an indicator for OSA requiring PSG confirmation.
Support (if any):

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0834

BEDTIME AND NAPTIME ROUTINES: ASSOCIATIONS WITH NEWBORN AND PARENTAL SLEEP OUTCOMES

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Introduction: A consistent bedtime routine is associated with better sleep and well-being in young children. However, little is known about the prevalence of bedtime and naptime routines in newborns, and their association with sleep outcomes in both the newborns and their parents.
Methods: Parents (67% mothers, 33% fathers) of 135 newborns (1-15wks; M=8.2wks) from the US and UK completed an online questionnaire addressing questions about sleep and routines in newborns, as well as measures of sleep in the parents (PROMIS sleep disturbance scale and sleep-related impairment scale).
Results: Overall, 62% (n=84) reported having a bedtime routine and 20% (n=27) a naptime routine for their newborn. Of these families, 50% started a bedtime routine before 4 weeks of age with 58% starting a naptime routine within the same time frame. Most parents who engaged in a bedtime routine indicated that they liked it (79%), it was easy (70%), it helped their newborn fall asleep (62%) and sleep for longer stretches overnight (54%). For those with naptime routines, approximately half liked them (54%) and reported they were easy (50%), but fewer thought they helped their newborn nap (35%). Most parents thought that sleep routines helped them bond with their newborn (88% bedtime, 69% naptime). Further, newborns with a bedtime routine had longer stretches of sleep (5.1h vs. 4.2h, p=.023), shorter total time awake during the night (128.6m vs. 175.7m, p=.002), and trended toward fewer night wakings (2.1 vs. 1.7, p=.070). Finally,

parents who had bedtime routines for their newborn were less likely to experience sleep disturbances themselves, p=.017, but there were no differences in sleep-related impairment.
Conclusion: Over half of all newborns have a bedtime routine, but only 20% a naptime routine. However, these routines are liked by parents and associated with increased sleep consolidation in newborns and decreased sleep disturbances in parents. A simple recommendation of instituting sleep routines for newborns may result in improved sleep outcomes for newborns and their parents.
Support (if any): Kenvue, Skillman, NJ, USA

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0835

IMPACT OF DAYLIGHT SAVING TIME CHANGE ON PARENTAL ANXIETY, STRESS, AND INFANT SLEEP EXPECTATIONS

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Introduction: Daylight Saving Time (DST) transitions can disrupt infant sleep routines, and lead to temporary sleep disturbances, potentially contributing to heightened stress levels for parents. This study examines the associations between DST-related stress, parental anxiety, and parental and infant sleep.
Methods: 602 parents of infants aged 0-24 months (11.45±5.5) from the US were recruited,79% mothers. A week prior to the spring DST transition, parents completed the Pittsburgh Sleep Quality Index (PSQI) and the Edinburgh Postnatal Depression Scale-3A (EPDS-3A) to assess perinatal anxiety. Additionally, they reported concerns regarding the impact of the DST change on their child's sleep (How long do you think it will take your child to adjust to the new time? How stressed are you about the impact of daylight saving on your child's sleep?). Objective infant total sleep time (TST) was measured using Nanit autovideosomnography for 7 nights prior to the DST change. Logistic regression analysis was performed with anxiety as the predictor and stress and anticipation about DST as the outcomes. Furthermore, a Wilcoxon test compared the average sleep duration of infants and parents between the anxious and non-anxious groups. An EPDS-3A score ≥5 was considered anxious. Infant age was a covariate in all analyses.
Results: Parents experiencing anxiety before DST were 1.98 times more likely (CI 1.15-2.42) to report being stressed about the DST change (p< 0.001), and were 1.66 times more likely (CI 1.15-2.42) to anticipate >3 days adjustment period for their child following DST (p=0.007) than those who did not experience anxiety. There was no significant difference in TST between infants of anxious and non-anxious parents, but non-anxious parents slept for an average of 11 minutes longer than anxious parents (p=0.017).
Conclusion: This study demonstrates that parents experiencing anxiety exhibit higher stress levels and more negative expectations regarding their infants' sleep during the DST transition than non-anxious parents. Moreover, anxious parents reported shorter sleep durations before the DST change compared to non-anxious parents. Notably, there was no significant difference in TST between infants of the non-anxious and anxious parent groups.
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0836

SIMILARITIES AND DIFFERENCES IN MATERNAL AND PATERNAL BED-SHARING BELIEFS IN MEXICAN AMERICAN COUPLES WITH TODDLERS

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Introduction: Room-sharing, but not bed-sharing is recommended for safe sleep, and pediatric behavioral sleep interventions commonly recommend a separate child sleep space, even when room-sharing. However, bed-sharing is more common globally and across cultural groups than in U.S.-based non-Latino White families. Further, most research has focused on maternal beliefs about bed-sharing, with little consideration of paternal beliefs. This exploratory study describes similarities and differences in maternal and paternal beliefs about bed-sharing in Mexican American couples with toddlers.
Methods: Fourteen Mexican American couples (mothers [27-41 years, mean education 12.8 + 3.7 years] and fathers [27-45 years, mean education 11.1 + 3.4 years]) with toddlers (78.6% boys; 12-15 months) completed the 17-item Bed-sharing Beliefs measure in Spanish (50%) or English. Half of families reported bed-sharing with their toddler. Although data collection is ongoing, we describe dyadic concordance (dyads both agree or disagree) or discordance (one person agrees, the other disagrees) in the current sample.
Results: The most dyadic concordant responses were parent sleep/privacy items: "bed-sharing interferes with the parents privacy" (100% concordance: 93% agree), "bed-sharing makes the parents sleep poorly" (86% concordance: 64% agree), and "bed-sharing helps the parent sleep well" (79% concordance, 36% agree). Teaching the child to sleep independently items also had strong dyadic concordant responses: "bed-sharing makes the transition to their own bed harder" (79% concordance, 64% agree), "bed-sharing makes it harder for the child to sleep on their own" (79% concordance, 64% agree), and "bed-sharing makes the child dependent on the parent to sleep" (77% concordance, 62% agree). The greatest dyadic discordant responses were related to the child's sleep quality: 62% discordance for both "bed-sharing keeps the child from sleeping comfortably" and "bed-sharing interferes with the child's sleep." No differences between bed-sharing and non-bedsharing dyads were found.
Conclusion: Early findings from our ongoing study of sleep beliefs in Mexican American families with toddlers suggest greater parental concordance about the impact of bed-sharing on parental privacy/sleep and toddlers learning to sleep independently, with discordant beliefs about the impact of bed-sharing on child sleep quality. Further exploration of dyadic parental beliefs about bed-sharing and the relationship with sleep location is needed in a larger sample.
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0837

ASSOCIATIONS BETWEEN SLEEP HEALTH, DIET QUALITY AND MOVEMENT BEHAVIORS IN A COMMUNITY SAMPLE OF PRESCHOOLERS

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Introduction: Lifelong sleep, diet and movement behaviors are formed during the preschool (age 3-5) years. Inadequate sleep health (i.e., short duration, late bedtimes, low quality) and poor diet quality are independently associated with physical inactivity and subsequent risk of obesity development. Not known is how sleep health and diet quality may interact in association with movement behaviors (moderate-to-vigorous physical activity [MVPA] and sedentary behavior [SB]) during this critical period of the life course. This study explored the interaction between diet quality and sleep health on movement behaviors in a community sample of preschoolers.
Methods: Preschoolers from families living in Delaware communities wore an Actigraph on their waist for up to one-week (average wear time=6 days) to measure sleep health, SB, and MVPA. Sleep health metrics included sleep duration (minutes), timing of sleep onset and offset (hours), and sleep efficiency (percentage of time in bed spent asleep). Parents completed 3-days of dietary records for their child, and Nutrition Data Systems for Research (NDS-R) software was used to analyze these dietary records. Healthy Eating Index 2015 (HEI-2015) scores were derived (higher scores=better diet quality). Generalized Linear Models utilizing GEEs quantified the associations between sleep health and diet quality on SB and MVPA; and the interaction between diet quality and sleep health was explored. Models adjusted for age, sex, race, parent education, and BMI.
Results: In a sample of 24 preschoolers (mean age=4.6 years, SD=0.78; 50% male, 63% White, non-Hispanic), there was a significant interaction between diet quality and sleep timing on movement behaviors. Having an HEI-score above the sample median of 61 was associated with less SB ($p< 0.001$), but having a late bedtime ($p< 0.001$) and late wake time ($p=0.004$) tempered this association. Similarly, having an HEI-score above the median was associated with more MVPA ($p< 0.001$), but having a late bedtime ($p< 0.001$) and late wake time ($p=0.03$) tempered this association.
Conclusion: Our findings underscore the interdependence of health behaviors in preschoolers. Future integrated interventions may consider targeting multiple behaviors, including sleep timing, diet and physical activity, to impede early childhood obesity development.
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0838

SLEEP HYGIENE IN MEXICAN AMERICAN TODDLERS: BEDTIME SCREEN USE AND THE ROLE OF MATERNAL BELIEFS AND SELF-EFFICACY

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Introduction: Good sleep hygiene includes restricting screen use in the hour before bedtime. Despite this, bedtime screen use starts for many in early childhood. To inform the design of interventions aiming to promote quality sleep, a better understanding of parental conceptualizations about their children's bedtime screen use is needed. We evaluated whether maternal beliefs about bedtime screen use and self-efficacy to limit bedtime screen use are related to toddler screen use before bedtime in Mexican American families.
Methods: This study used data from a larger study enrolling Mexican American families with toddlers (15-26 months old) recruited from a federally qualified health system. Participants were asked how much they agreed that using a screen device before bed helps little children sleep better (belief) and how confident they were about limiting their toddler's bedtime screen use (self-efficacy). Screen use before bedtime was measured via a 7-day diary completed by mothers, resulting in a count of nights the child used a screen device in the hour before bedtime. We used multiple regression to evaluate whether maternal beliefs and self-efficacy were associated with toddlers' bedtime screen use, adjusting for child age, and maternal education and employment status.
Results: Participants (n=286) were on average 31.4 years old (SD=5.9) and 73% reported ≤ high school degree. Mean child age was 21.7 (SD=3.1) months. Over one-third (36%, n=103) of children used a screen device in the hour before bedtime at least 4 nights per week. Mothers' stronger beliefs that screen use before bed helps with sleep (Incidence rate ratio (IRR)=1.22, 95% CI 1.06-1.41) and mothers' lower self-efficacy to limit bedtime use (IRR=0.79, 95% CI 0.70-0.89) were associated with greater toddler bedtime screen use.
Conclusion: Maternal beliefs and self-efficacy regarding limiting screen use at bedtime should be considered in interventions addressing toddler sleep hygiene in this population.
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0839

PARENTAL PERSPECTIVES ON THE EFFECTIVENESS OF A SLEEP INTERVENTION FOR PRESCHOOLERS: A PRELIMINARY ASSESSMENT

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Introduction: Healthy sleep is essential to a child's development, particularly during preschool. However, interventions that address sleep difficulties among children in this age group are scarce. This preliminary study explored parental perspectives on the effectiveness and barriers of a short sleep intervention for preschool children.

Methods: Twenty-nine families (either one or both parents) and their 3 to 5-year-olds participated in a two-hour sleep intervention and one-hour follow-up meeting to address children's sleep difficulties. Parents were taught about children's optimal sleep habits. They were given tips on maintaining a consistent bedtime routine, managing their child's anxiety at bedtime and during the night, helping their child fall asleep independently, and reducing the occurrence of nightmares and night terrors. Parents were asked open-ended questions two months later to assess its success and barriers. Responses were analyzed using NVivo 14.23.2 to identify common themes.
Results: Numerous parents reported that their child's sleep improved in at least one aspect after the intervention. The most reported improvements were reduced nighttime awakenings, improved sleep independence, reduced sleep onset latency, a consistent sleep schedule and routine, and reduced conflicts at bedtime. More than half of parents noted that at least one aspect of their own sleep had improved, the most common being reduced sleep fragmentation. Almost all parents denoted other positive outcomes, such as better moods and reduced fatigue in children, increased patience, more personal time, improved mood and heightened energy levels in parents. A few parents indicated having a better relationship with their child. Sleep difficulties persisted in some children, such as trouble falling asleep, autonomous sleep and nighttime awakenings. Among parents who identified obstacles in implementing sleep strategies, conflicts at bedtime, changing sleep schedules, separation anxiety, and screens before bedtime were the most frequent.
Conclusion: Parents found the brief intervention effective and well-suited to their specific needs. Reducing children's sleep difficulties contributed to improving parents' sleep quality and the overall health and well-being of the family. This research highlights the need for tailored interventions that address preschoolers' sleep issues.
Support (if any): This study was funded by the Social Sciences and Humanities Research Council of Canada (SSHRC).

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0840
CENTER-BASED CHILDCARE ATTENDANCE AND SLEEP IN CHILDREN UNDER SIX YEARS OLD: A SYSTEMATIC REVIEW

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Introduction: Many children within and outside of the United States spend a considerable amount of time in childcare settings during early childhood. The early childhood period is also marked with significant transitions in sleep, and many young children rely on a combination of daytime and nighttime sleep to meet their sleep needs. Thus, childcare settings may impact children's sleep outcomes. The current systematic review aims to summarize findings of past research examining center-based childcare attendance and sleep outcomes.
Methods: We followed the steps outlined by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) methodology. Keywords related to sleep and childcare were entered into PubMed and PsycINFO on November 13, 2023, yielding 2,355 articles. Articles were reviewed using the following inclusion criteria: population included children ages 0-6 years old, intervention included formal center-based childcare attendance, control or comparison included between-subject (i.e., center-based childcare vs. no center-based childcare; half-day vs. full-day) and within-subject (i.e., weekdays vs. weekends) designs, outcomes included sleep duration and timing, and study designs included observational and experimental research. Methods were critically assessed using the Appraisal Tool for Cross-Sectional Studies (AXIS).
Results: Nine studies were included in the final data extraction process. Studies were conducted in five countries: Japan (n=5), United States (n=1), Malaysia (n=1), France (n=1), and Australia (n=1). Evidence indicated that center-based childcare attendance is associated with decreased sleep duration, though findings were mixed. Four studies found that attendance was associated with shorter nighttime sleep duration whereas one study found null association. Two studies found positive association between attendance and daytime sleep (i.e., weekends/weekdays, half/full day) whereas one study found a negative association when comparing childcare type (i.e., relative/non-relative). Two studies found no association between attendance and total sleep duration. Most studies reported nighttime sleep and did not use an objective measure of sleep. Classifications of childcare type varied, making comparisons across studies challenging.
Conclusion: More research is needed to examine how center-based childcare attendance may impact sleep outcomes in young children. Future research should use objective measures of sleep when possible and describe details about childcare consistently to facilitate comparison or generalization.
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0841
TIGERCHAT: SLEEP AND CELLPHONE ACCESS IN RURAL ELEMENTARY SCHOOL CHILDREN

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Introduction: There is increasing awareness of the importance of sleep for health and wellness in children, and the impact technology has on sleep. However, many children are not getting the necessary sleep for optimal school functioning. The purpose of this project is to describe cellphone access, placement at night, and bedtime in 8–9-year-olds attending an elementary school in a rural area.
Methods: TigerCHAT is a school-based health education outreach program for children K-6th grades. It focuses on 45-minute sessions addressing various health topics, including sleep. Data are collected after IRB approval. In fall of 2022, nursing students led small groups of students in a sleep educational module during their gym period. Before education began, 50 3rd- grade students filled in a questionnaire regarding phone usage (do they have one, location during bedtime, bedtime and wake time).
Results: Frequencies, percentages, and ANOVA were run on the data to describe sleep and phone placement during the nighttime. Children ages 8-9 years (n = 50, 49% female, 51% male, 91.2% White, 8.4% Black, 46.4% classified as economically disadvantaged, 41% receive free or reduced lunch). Over half reported having a cellphone (n=31, 62% yes; n=19, 38% no). Of those with a cellphone, eleven (22%) reported having it under or by pillow, 11 (22%) reported having it on the bedside table, and 9 (18%) reported it not in their room at night. There was no significant difference in bedtime between those with a phone or without (F=.696, p=.402,) or where cellphone was located (in vs outside room) (F=1.55, p=.277). Children self-reported an

average bedtime of 9:12pm (range 7:30pm-1am), and an average wake time of 5:15am (range 4:30am-6:30am), with an average total sleep time of 8.3 hours (range 4-10 hours).
Conclusion: The majority of students in this sample reported having access to a cellphone, and also reported having the cellphone close to them at night. While there was no significant difference in bedtime based on location or having a phone in this sample, it is still an important aspect of the sleep environment. Future studies should examine the significance of nighttime cellphone placement for school age and adolescent populations.
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0842

PARENT ENGAGEMENT WITH DIGITAL SLEEP HEALTH INTERVENTIONS FOR YOUNG CHILDREN: A GLOBAL SCOPING REVIEW

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Introduction: It is widely recognized that young children may experience sleep problems early in life that affect child development outcomes. Digital technology offers an accessible platform to reach and engage families of young children with sleep health solutions early in life.Our global scoping review aimed to investigate the use of digital technology as a resource to facilitate parental interventions aimed at enhancing sleep health among children in early childhood (3 –8 years old).
Methods: We performed a scoping review of peer-reviewed articles published from inception to 2023 for the following databases: PubMed, Embase, Web of Science including FSTA and Scielo, MEDLINE, Cochrane Library, Engineering Village, CINAHL, APA PsycInfo, Global Health and citation searching. In conjunction with the authors, two librarians conducted an extensive literature search, and the strategies can be found at [osf.io/74hba]. Our methodological approach encompassed a systematic review of key terms related to sleep, communication, parental involvement, and internet-based intervention. Inclusion criteria included intervention studies with parents of children 3-8 years old via digital communications (e.g. social media, telehealth, websites, mobile apps, wearable devices) to address sleep health in their child. Exclusion criteria included platforms unrelated to sleep, studies that digitally recruited participants but did not use a digital platform, studies with children outside the target age, or protocol studies. Review Registration: https://doi.org/10.17605/OSF.IO/TNFY2
Results: Four articles met the final inclusion criteria. A final sample size of 194 parent-child dyads across Australia, Canada, the Netherlands, and the United States were enrolled. Mean child age was 5 years old and mean parent age was 37. Sleep health behavior outcomes in children addressed by digital mobile health solutions included bedtime resistance, night wakings, sleep onset, sleep duration, obstructive sleep apnea, sleep latency and independent sleep in child's own bed. Sleep health outcomes also included positive improvements in parent sleep health education.
Conclusion: Parent engagement with child sleep health interventions yielded favorable outcomes, enhancing the overall sleep health of children. More research is needed to understand tailored interventions for sustained sleep health improvements in child sleep.
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0843

IMPROVING DAYTIME SLEEPINESS IN CHILDREN WITH NARCOLEPSY: A QUALITY IMPROVEMENT INITIATIVE

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Introduction: Narcolepsy affects 25-100/100,000 people in the US. Daytime sleepiness associated with pediatric narcolepsy negatively impacts quality of life (QoL), academics, vocational function, and personal safety. The Epworth sleepiness scale (ESS) is a validated tool that measures daytime sleepiness. We aimed to improve daytime sleepiness in children with narcolepsy at our center using quality improvement process to increase the percentage of narcolepsy patients with at least a 30% improvement of ESS from baseline.
Methods: We created a multidisciplinary quality improvement (QI) team in 2019 and used standard QI methods. Key drivers included access to care, patient and family engagement in care, follow up tracking, and complete provider documentation. We conducted plan-do-study-act (PDSA) cycles and tracked progress with a run chart. Interventions included pre-visit planning tool enhancement, tracking duration between visits and missed clinic visits, contacting patients with ≥2 missed visits, tracking prescriptions, identifying patients without referrals for behavioral/psychological support, and treating comorbid sleep disorders. Process measures included the ESS completion rate and days between visits. The primary outcome measure was improvement on the ESS. A secondary outcome measure was improvement in QoL (10% improvement in the PedsQL score).
Results: Between 2019 and 2023, 101 patients had 605 visits. The ESS completion rate (>90% pre-COVID), decreased during COVID to 57% and improved to a median of 70% in 2023. The ESS completion rate was lower for telehealth (36%) than in-person visits (90%). Pre-COVID, the median days between visits was below goal (< 200 days) at 156 days but increased to 210 days in December 2020. Approximately three years after project initiation, 62% of patients had at least a 30% improvement in the ESS score. Improvements were sustained over 16 months. Average decrease in ESS score was 9.9 points (score range: 0-24)since 1/2020. The median baseline PedsQL score was 64.7 (borderline unhealthy) and increased by 14%.
Conclusion: Using QI methods and multiple interventions, we increased the percentage of narcolepsy patients with at least a 30% improvement in the ESS score to >60%. Ongoing challenges include accommodating increased patient volume, reducing process variation in ESS completion, and standardizing documentation practices for ESS scores.
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0844

IMPROVING THE CARE OF PEDIATRIC PATIENTS WITH NARCOLEPSY

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Introduction: Narcolepsy is a rare disorder characterized by disabling excessive daytime sleepiness and signs of REM-sleep dissociation. Pediatric narcolepsy has a different clinical presentation and may be difficult assess, but still can lead to severe impairments. Due to the importance of narcolepsy and the effects on quality of life we aimed to analyze and adjust our processes for caring for pediatric patients with narcolepsy to reach 90% compliance or greater with recommended quality measures.
Methods: Utilizing the AASM Quality Measures, medical records were reviewed from the Children's Wisconsin Sleep Disorders Center with a diagnosis of narcolepsy from January 2018 until May 2023. Baseline compliance with recommended quality metrics were established. Those with a compliance rate of 80% or less were selected for the four step Plan-Do-Study-Act cycle. Data was continuously collected and analyzed quarterly to track compliance and address deficiencies in current processes.
Results: Pre-intervention data collection from 2017-2018 had compliance of 52% in documentation of the sleepiness assessment. Practice adjustments included educating clinical staff and distributing clinic questionnaires which improved compliance to 100%. With telehealth, compliance decreased to 90% and required an adjustment to clinical providers performing the assessment. Additional changes included developing an EMR Narcolepsy template to include safety counseling and education. Utilization of telehealth allowed annual follow up to remain >90%, even if patients delayed or cancelled an annual visit. For the small population of new patients compliance fluctuated between 0-100% for initiating treatment in part due to parent scheduling and clinic availability.
Conclusion: It is essential to ensure proper diagnosis, prompt treatment initiation, regular follow up of symptoms and response to treatment, and safety practices for those with Narcolepsy. With simple adjustments, compliance improved, but due the COVID-19 pandemic care delivery changed. The plan was to temporarily shift to a telehealth model, telehealth enabled us more flexibility to discuss results and manage treatments when necessary. Utilization of online questionnaires through patient portals can update the EMR. Work is ongoing to further explore how technology can be used to reach patients and maintain consistent follow up.
Support (if any): Internal funding provided by the Children's Wisconsin Department of Pediatrics

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0845

THE CONTRIBUTIONS OF SLEEP AND CIRCADIAN PARAMETERS TO ADOLESCENTS ADHD SYMPTOMS

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Introduction: Attention-deficit/hyperactivity disorder (ADHD) is a chronic and debilitating disorder that negatively impacts adolescents' academic achievements and interpersonal relationships. Individuals with ADHD are two to three times more likely to experience sleep problems. It has been proposed that untreated sleep problems exacerbate ADHD. However, empirical evidence regarding the relative contributions of specific sleep issues to the daytime manifestation of ADHD symptoms among adolescents is limited. The objective of this study was to determine the relative contributions of sleep and circadian parameters to adolescents' ADHD symptoms.
Methods: A sample of 40 unmedicated adolescents (26 girls, 18 boys) between the ages of 12 to 15 years (M= 13.9; SD = 0.95) with no psychiatric or medical comorbidities participated in the study. Sleep EEG was recorded using a single night of ambulatory sleep EEG (Sleep Profiler) monitoring with frontal derivations during the school week in the child's home. Automated sleep/wake scoring was performed using the system followed by visual scoring and analysis by an experienced pediatric sleep specialist. In addition, adolescents were asked to complete questionnaires regarding insomnia and circadian problems and ADHD symptoms. Parents were asked to provide demographic information and complete questionnaires regarding their child's ADHD symptoms, sleep, and daytime behavior.
Results: Linear regression analysis revealed that PSG-based sleep duration, adolescents' reported insomnia symptoms, and parents' reported Restless Leg Syndrome symptoms contributed to the manifestation of adolescents' ADHD symptoms above and beyond gender or SES. No other effects were significant.
Conclusion: Adolescents' ADHD symptoms were related to different sleep problems requiring different interventional strategies. These findings provide compelling motivation for the development of interventions that use sleep as a means to improve the daytime functioning of adolescents with ADHD. Clinical Implications Given the negative impact of unhealthy sleep on adolescents' mental, cognitive, and physical health, it is essential that clinicians integrate sleep assessments and interventions into their screening, diagnosis and ongoing care for adolescents, particularly when caring for adolescents with behavioral and functional difficulties.
Support (if any): CIHR Grant 418638 to Dr. Reut Gruber

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0846

DEVELOPMENT OF A PEDIATRIC SLEEP ROUTINE QUESTIONNAIRE FOR BLACK FAMILIES: A HUMAN-CENTERED DESIGN APPROACH

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Introduction: Bedtime routines are the hallmark for sleep guidance in young children. Yet, Black children have an 80% increased likelihood of not having a bedtime routine, compared to white children. To promote healthy bedtime routines, a comprehensive assessment tool that capture children's bedtime routine behaviors and relevant bedtime environment and context is needed to guide the targeting areas for intervention. However,

existing sleep routine questionnaires do not capture sleep contexts that are relevant to Black families. Thus, the objective of our study was to develop a comprehensive sleep routine questionnaire that captures child's bedtime routine behaviors, and household adult-child interaction and bedtime environment that support health bedtime behaviors. As the first step of the measurement development, we focused on study cultural relevance, salience and appropriateness of the three bedtime measures: 1. the Parent-Child Sleep Interaction Scale, 2. Bedtime Routines Questionnaire, and 3. Child Routines Inventory scales, prior to formal administration.

Methods: A human-centered design process, Ecological Theory (considering individual, home, black community contexts), and qualitative formative research methods were applied to guide sleep routine questionnaire adaptation. A convenience sample of five Black caregivers with preschool-aged children were interviewed and provided feedback for the bedtime routine surveys. Interview questions were guided by human-centered design, centering the lived experience of the caregivers, as well as multiple-domains of sleep contexts and behaviors to understand child sleep routine practices, household structure, child sleep environment, social-family connection, social support and child sleep decision-making.

Results: Thematic areas of caregiver feedback fell into the following three areas: 1. deficit-based and focused on punitive discipline, 2. Do not capture child weekend sleepovers at Grandparent's house, 3. Two-home households were not reflected, 4. Racial options for mixed children were not reflected and 5. age-appropriate activities were not reflected in the measures.

Conclusion: Current pediatric bedtime routine sleep measures are not culturally tailored for Black families of preschool aged children. Future steps include holding caregiver focus groups to glean relevant survey items/domains for the development of a new comprehensive culturally tailored measure for Black preschool-aged children that can be used to guide the intervention and intervention theory of testing.

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0847

THE ROLE OF PULSE WAVE AMPLITUDE IN DETECTING AROUSALS IN CHILDREN WITH HYPERSOMNIA

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Introduction: Changes in pulse wave amplitude (PWA) are a sensitive marker for both cortical and autonomic arousals, and are readily available in conventional polysomnogram recordings. The aim of the current study was to examine electrocortical versus PWA-based arousals in pediatric patients being evaluation for disorders of central hypersomnolence.

Methods: Polysomnograms for thirty consecutive patients who underwent multiple sleep latency test (MSLT) were identified. A drop in PWA signal of at least 30% that lasted for 3 seconds was needed to identify arousals. Arousals on overnight polysomnogram were rescored based on PWA drop. Patients were classified based on MSLT results into 3 groups: Narcolepsy group if mean sleep latency < 8 minutes and the presence of 2 or more sleep onset rapid eye movement periods (SOREMP); idiopathic hypersomnia (IH) group if mean sleep latency < 8 minutes and less than 2 SOREM periods; or normal if they did not meet criteria for narcolepsy or IH. Group differences in electrocortical arousal index (AI) vs PWA-based arousal index were examined via ANOVA.

Results: Out of the 30 patients included, there were 19 patients with normal MSLT, 7 patients with narcolepsy, and 4 patients with IH. There were no significant between-group differences for age, total sleep time (TST), sleep efficiency (SE), sleep latency (SL), REM latency, N1, N2, N3 or REM percentages, apnea hypopnea index (AHI), or periodic limb movement index (PLMI). There was were no significant differences between electrocortical AI in normal (9.4+/-4.4), IH (9.1/hr+/-4.9), and narcolepsy (10.6+/-6.6) groups (F(2,27)=[0.156], p=0.857). In contrast, there statistically significant between-group differences in PWA-based AI (F(2,27=[3.765], p=0.036). Post-hoc analysis demonstrated higher PWA-based AI in narcolepsy vs normal (24.2+/-10.4 vs 16.2+/-5.3, p=0.017), a trend for higher levels in IH vs normal (22.3+/-8.5 vs 16.2+/-5.3, p=0.131), and no difference between narcolepsy and hypersomnia groups (24.2+/-10.4 vs 22.3+/-8.5, p=0.674).

Conclusion: Pulse wave amplitude may hold promise as a scoring tool to help identify arousals and sleep disruption in patients with central disorders of hypersomnolence. Further studies are needed to verify these preliminary results and explore the utility of PWA-based AI in other sleep disorders.

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0848

THE UTILITY OF PULSE WAVE AMPLITUDE TO IMPROVE INTERSCORER RELIABILITY

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Introduction: While accurate scoring of arousals is crucial for identification of disrupted sleep architecture and hypopnea scoring, achieving acceptable interscorer reliability represents a major challenge. The drop in pulse wave amplitude (PWA) signal is a sensitive marker for arousals and is readily available in most conventional polysomnogram software. The aim of the current study was to examine interscorer agreement in scoring cortical arousals using EEG alone versus utilizing PWA drop signal as surrogate marker.

Methods: Arousals were scored using the same data on duplicate studies by the sleep laboratory medical director and education coordinator who is registered polysomnographic technologist (RPSGT). The first study was scored according to the American Academy of Sleep Medicine (AASM) arousal rule only. The second study used the drop in PWA as a marker for a possible cortical arousal in conjunction with the AASM arousal rule. A drop in PWA signal of at least 30% that lasted for 3 seconds was needed to identify possible arousals. Interscorer agreement and Cohen's Kappa were calculated as measures of reliability.

Results: When scored using conventional EEG arousal criteria alone, there was an overall 90.3% agreement for all epochs with a corresponding Cohen's Kappa of 0.642 (95% CI: 0.580-0.704), representing substantial agreement. When PWA assistance was utilized, agreement was significantly improved to 96.5% overall with a corresponding Cohen's Kappa of 0.878 (95% CI: 0.840-0.917), representing almost perfect agreement.

Conclusion: Pulse wave amplitude may hold promise as a surrogate tool for identifying cortical arousals and improving inter-scorer reliability.
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0849

CHARACTERIZATION OF PATIENT REFERRALS TO ED/INPATIENT ADMISSION FROM AN OUTPATIENT PEDIATRIC SLEEP CENTER

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Introduction: The medical complexity of patients referred to our pediatric laboratory has been increasing. These children are at higher risk of severe sleep disordered breathing and/or risk of emergent medical issues during the study. As a result, patients may need to be referred directly to emergency room or inpatient admission from the ambulatory sleep lab. In this single site pediatric sleep lab quality improvement project, we identify the frequency of ED/inpatient referrals from attended, in-lab sleep studies, reasons for referrals, and contributing factors for referral.
Methods: This is a cohort study of patients who had in-lab ambulatory polysomnogram at Boston Children's Hospital between March 2017 to May 2022 identified through chart review search terms (ED or inpatient diagnostic codes within 24 hours of polysomnogram billing code). We performed chart review for demographics, past medical history, sleep study variables, medications, and disposition. We used chi-square tests to compare age and medical complexity categories.
Results: Of 6724 PSG studies conducted, 95 (1.4%) patients were referred to ED or inpatient admission within 24 hours from the sleep study. Demographics: Patients ranged in age from 1 month to 20 years [mean age 5.5(6) years] and the cohort was 38% female, 53% Caucasian, 12% Black, 2% Asian, 13% Hispanic, 6% other, 14% race/ethnicity not reported. Of the 95 patients referred to ED/inpatient hospitalization, 64% needed continued medical assistance in the morning due to various problems including persistent hypoxia, hypercarbia, altered mental status, difficulty tolerating oral intake, or need for assistance ambulating. Features such as age and patient triage level assigned prior to sleep study did not predict whether patient returned to baseline upon wakening. The reason for referral for ED or admission included severe sleep disordered breathing (e.g. obstructive sleep apnea or central sleep apnea; 33.8%), persistent hypoxia/hypercarbia (23.1%), cardiac (e.g. arrhythmias, worsening heart disease; 10.8%), vomiting/diarrhea (10.8%), neurologic (e.g. seizures, paroxysmal events, altered mental status; 7.7%), infection (e.g. fever/infection concern; 3.1%), allergy/anaphylaxis (1.5%), behavioral/psychiatric (1.5%), and metabolic derangements (e.g. hypoglycemia; 1%).
Conclusion: This quality improvement project informs sleep lab policies and procedures regarding staffing, training and management of urgent medical issues that arise during pediatric sleep studies.
Support (if any): None

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0850

IMPLEMENTATION OF THE SAN DIEGO SLEEP SURVEY (SDSS) IN CHILDREN WITH AUTISM

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Introduction: Children with autism (CWA) experience a high frequency of sleep disorders, which impact their well-being and development. Polysomnography faces challenges due to sensory sensitivities and communication difficulties in CWA. Therefore, sleep questionnaires play a critical role in gathering comprehensive information about sleep patterns and disturbances, potentially aiding in the identification of sleep disorders. The diagnostic potential of questionnaires could facilitate earlier access to tailored interventions for CWA, promoting enhanced sleep quality and better overall health outcomes.
Methods: Caregivers of patients aged 1 to 21 years referred to Rady Children's Hospital Sleep Center, San Diego, CA, completed the San Diego Sleep Survey (SDSS) via the Epic® EMR system. CWA were identified using diagnostic codes (ICD-9/10). Additionally, surveys were collected from children without sleep complaints (control) at San Ysidro Children's Dental Center and Chula Vista Medical Plaza. The SDSS, a 51-item scale, employed a 4-item Likert-type scale (Never, Sometimes, Usually, Do Not Know) for graded insights into sleep problems. Five domain scores assessed pediatric sleep problems: insomnia, sleep-disordered breathing (SDB), sleep disorder (e.g., parasomnia), sleep hygiene, and daytime symptoms (DS). A subset also completed the Pediatric Sleep Questionnaire (PSQ) and Children's Sleep Habits Questionnaire (CSHQ) for comparative purposes.
Results: 2103 patients completed SDSS (age 8.6±4.8). Of these, 241 CWA were identified (age 8.2±4.7; 64 females [27%]). Compared to controls (n=135, age 9.4±2.4), CWA had significantly better hygiene scores (9.3±2.3 vs 9.9±2.3, p=0.03), higher insomnia scores (17.1±4.4 vs 12.9±3.3, p< 0.01), higher SDB scores (18.4±6.2 vs 13.8±6.1, p< 0.01) and higher DS scores (31.5±7.0 vs 19.5±5.9, p< 0.01). 89 CWA completed the PSQ which identified 71 children (81%) with a positive SDB score (PSQ Total Score ≥8) compared to 189 children (65%) with a positive SBD score on SDSS. Forty-eight CWA completed the CSHQ; and all patients had a positive score (CSHQ Total Score ≥41).
Conclusion: The SDSS is a viable method for evaluating sleep disturbance in CWA, recognizing abnormalities in various domains. Future analyses will compare SDSS to PSQ and CSHQ to assess convergent validity for screening for sleep disorders. Additionally, sensitivity/specificity analyses of SDSS compared to the gold-standard of polysomnography will be explored.
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0851

SLEEP MODERATES BEHAVIORAL DIFFICULTIES AND QUALITY OF LIFE IN AUTISTIC CHILDREN

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Introduction: Research indicates a relationship between increased behavioral difficulties (e.g., irritability, social withdrawal, stereotypic behaviors, noncompliance, inappropriate speech) and poor quality of life (QoL) in autistic children. However, little is known about how sleep may be associated with this relationship. To assess the mechanistic role of sleep, we examined whether autistic school-age child sleep moderated the relationship between behavioral difficulties and QoL.
Methods: Children with autism spectrum disorder (N=65; Mage=8.95, SD=2.01, range 6-12; 74% male), verbal IQ >70, and parent reported sleep complaints completed 14 days of sleep diaries (with parental assistance) and their parents completed surveys (Child Sleep Health Questionnaire-CSHQ, Pediatric Quality of Life-PedsQoL, Aberrant Behavior Checklist-ABC). Multiple regressions (SPSS PROCESS Model 1) examined whether sleep (subjective diary total sleep time-TST; CSHQ total score) moderated associations between behavioral difficulties (irritability, inappropriate speech, stereotypic behaviors, hyperactivity) and QoL (health, social, emotional, school) in baseline data. Analyses controlled for age.
Results: CSHQ moderated associations between irritability and social QoL (β=.34, p=.04). In children with the best overall sleep health, less irritability was associated with better social QoL, β=-6.32, p=.002. CSHQ also moderated associations between hyperactivity and school QoL (β=.25, p=.02). Similarly, in children who had the best overall sleep health, less hyperactivity was associated with better school QoL β=-3.84, p=.001. TST moderated associations between inappropriate speech and social QoL (β=-.12, p=.02). At the longest TST, less inappropriate speech was associated with better social QoL, β=-3.45, p=.001. TST moderated associations between stereotypic behaviors and social QoL (β=-.10, p=.04). At the longest TST, less stereotypic behaviors were associated with better social QoL β=-15.14, p=.004.
Conclusion: The present findings suggest that, in autistic children, the relationship between behavioral difficulties and school/social QoL depends on overall sleep health, particularly TST. It is possible that improving sleep through behavioral sleep treatments may change the relationship between problematic behaviors QoL in this population. However, more research using longitudinal, experimental, and trial methodology and perhaps even examining other aspects of TST (e.g., variability) are needed.
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0852

SELF-HELP STRATEGIES FOR SLEEP IN CHILDREN AND ADOLESCENTS WITH EPILEPSY

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Introduction: Children and adolescents with epilepsy have more sleep problems compared to their healthy peers. These sleep problems not only negatively impact development and quality of life, but also pose challenges in managing epilepsy effectively. The purpose of this cross-sectional study was to explore the use of self-help strategies for sleep among children and adolescents with epilepsy and examine the association between these strategies and sleep.
Methods: Seventy-five children and adolescents with epilepsy aged 1 to 17 years (mean age: 10.29 years) were recruited from a university-affiliated hospital between July 2022 and November 2023 in Taipei, Taiwan. They wore an actigraph on their wrist for a week, while their parents concurrently completed a sleep diary to document the utilization of any self-help strategies for sleep during the same period. Parent-reported sleep in children and adolescents was obtained using the Children's Sleep Habits Questionnaire (CSHQ). Data were analyzed using independent samples t-test.
Results: Of all the participants, only 17 (22.7%) children and adolescents had a nighttime sleep efficiency greater than 85%. The average total score of the CSHQ was 52.31±7.46, indicating moderate to severe sleep disturbance. Thirty-one (41.3%) parents reported using self-help strategies to help their children and adolescents sleep. These strategies included listening to music or stories (n = 14, 18.7%), reading books (n = 13, 17.3%), accompany (n = 6, 8%), using relaxation techniques (n = 2, 2.7%), feeding (n = 2, 2.7%), and giving teething toys (n = 2, 2.7%). There were no statistically significant differences ($p > 0.05$) in sleep efficiency and CSHQ scores between children and adolescents who used self-help strategies for sleep and those who did not.
Conclusion: Many children and adolescents with epilepsy experience sleep disturbance and poor sleep quality, with a significant proportion attempting to use self-help strategies to improve their sleep. Our findings highlight the importance of managing sleep in this population and suggest the need for further exploration into the effectiveness of specific self-help strategies for sleep in children and adolescents with epilepsy.
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0853

THE IMPORTANCE OF ACTIGRAPHY IN ASSESSMENT OF HYPERSOMNIA IN CHILDREN

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Introduction: Daytime sleepiness is a significant pediatric health problem, with prevalence ranging from 4% in preadolescents to almost 20% in high school seniors (1,2,3). When hypersomnia is present both subjective and objective means of assessment is required. Subjective measures range from parent interview to self-report questionnaires and a daily diary filled over the course of days or months. Objective data is mostly acquired using actigraph devices. A systemic review by the American Academy of Sleep Medicine (AASM) found a single study examining nightly sleep duration using both actigraphy and sleep logs over the course of 2 weeks among adult sleep patients with excessive daytime sleepiness. It found self-reported daily total sleep time (TST) overestimated sleep by an average of 86 minutes (4). To the best of our knowledge there was no such comparison

published in the pediatric population. We estimate that the same clinically significant difference exists in the pediatric population when comparing subjective report of daily total sleep time to an objective actigraphy measurement.

Methods: This retrospective cohort study used a convenience sample of 17 children aged between 6 to 20 years, presenting with hypersomnia to the sleep clinic between August 2022 and May 2023. Reported daily total sleep time was collected during their initial clinic visit and all children were given an actigraph for 2 weeks and were instructed to wear it continuously.

Results: Actigraph adherence was 91% with an average usage of 13 days. Self-reported daily TST was overestimated by 3.1 hours on average as compared to actigraph data. This was a statistically significant, $t(16)=2.1199$, $p< 0.01$.

Conclusion: Interviews, questionnaires, and diaries are subjective and tend to describe the perception of sleep. When evaluating hypersomnia an objective tool is essential. sleep insufficiency in hypersomnia patients may be overlooked when the daily total sleep time is assessed using the subjective patient's report. The simultaneous use of actigraphy may be preferable in this assessment to avoid misdiagnosis and treatment errors.

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0854

OBSTRUCTIVE SLEEP APNEA WITH OBESITY HYPOVENTILATION SYNDROME: DEEP VEIN THROMBOSIS RISK AFTER BARIATRIC SURGERY

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Introduction: Morbidity and mortality in patients with untreated obesity hypoventilation syndrome (OHS) is significant. The vast majority of OHS patients have concomitant obstructive sleep apnea (OSA), known to be associated with worse cardiovascular outcomes following bariatric surgery. However, there is limited data on the post-bariatric surgery outcomes of patients with OHS.
Methods: We queried TriNetX Analytics, a federated health record and claims-derived database of >115 million patients across 5 countries. We established two cohorts of patients with OSA (ICD-10-CM G47.33) who underwent laparoscopic bariatric surgery (CPT 1007387) between 5/1/2008-5/1/2023: one with superimposed OHS (E66.2) and one without. We examined the 30-day incidence of deep vein thrombosis [DVT (I82)], pulmonary embolism [PE (I26)], stroke [CVA (I63)], and myocardial infarction [MI (I21)]. We then re-examined these outcomes following extensive in-platform propensity score matching (PSM) to account for demographic and comorbidity antecedents.
Results: A total of 66,085 bariatric surgery patients were isolated, all in the US. Of these, 26,392 (40%) were diagnosed with OSA prior to surgery, of which 1,176 (1.8%) also carried a diagnosis of OHS. Prior to PSM, the OSA+OHS cohort experienced a significant excess incidence of all outcomes besides CVA when compared to the cohort with OSA alone: DVT risk was 3.9 vs 1.1% (OR 3.5, CI 2.6-4.4), PE risk 2.6 vs 0.9% (OR 3.0, CI 2.1-4.5), composite DVT/PE risk 5.4 vs 1.8% (OR 3.2, CI 2.4-4.1), CVA risk 0.9 vs 0.6%, MI risk 1.4 vs 0.4% (OR 3.3, CI 2.0-5.5), composite CVA/MI risk 2.0 vs 1.0% (OR 2.0, CI. 1.3-3.2). Following PSM, which generated two like sub-cohorts of 1,167 each, significant risk excess was retained only for DVT incidence: DVT risk was 3.8 vs 2.0% (OR 1.9, CI 1.2-3.2), but not for PE risk 2.4 vs 2.1%, DVT/PE risk 5.1 vs 3.7%, CVA risk 0.9 vs 1.2%, MI risk 1.5 vs 1.5%, and CVA/MI risk 2.0 vs 2.4%.
Conclusion: Our findings suggest that patients with OSA and OHS undergoing bariatric surgery experience similar rates of adverse cardiovascular events in the first postoperative month as those with OSA alone. The exception is DVT risk, which appears greater in the OHS-OSA cohort despite matching.
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0855

INVESTIGATE FACTORS THAT MODULATE TEMPORAL RISK FOR DEVELOPING NEW HYPERTENSION AMONG PATIENTS WITH SLEEP APNEA

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Introduction: Obstructive sleep apnea (OSA), which is the most common sleep-related breathing disorder, often occurs in the context of multimorbidity. The primary purpose of our study was to investigate the temporality of comorbidity that modulate the risk for developing hypertension (HTN) among patients with OSA without pre-existing HTN at baseline OSA diagnosis.
Methods: Our cohort consisted of cases with OSA and the 20 most common comorbidities defined using our previously validated EHR-based algorithm. We then constructed a survival model, controlling for age, sex, and BMI. In our survival model, the index date was date of first OSA diagnosis and we estimated time-to-first HTN diagnosis. Because our survival analysis requires accurate dates of diagnosis both for OSA and HTN, we also performed a validation of the dates of diagnosis of OSA and HTN identified from our algorithm by utilizing clinical chart reviews in 400 randomly chosen EHR-defined cases.
Results: We identified 76,519 OSA cases, among 53,035 cases diagnosed from 2012 to 2021. 31,741 cases (59.8%) without pre-existing HTN diagnosis at the date of OSA diagnosis met our inclusion criteria. Within our survival cohort, 15,830 (49.9%) OSA cases did not develop HTN. Age, Black race, BMI, atrial fibrillation, coronary atherosclerosis, pure hyperlipidemia, hypercholesterolemia, GERD, type 2 diabetes, tobacco use, other anemia, osteoarthrosis increased risk of HTN development. Female sex, allergic rhinitis, malaise and fatigue, joint pain, vitamin D deficiency were observed not to increase risk of HTN development. Moreover, clinical chart review demonstrated that OSA diagnosis and HTN diagnosis were documented in notes a median of 38 days and 738 days (respectively) prior to being coded in the EHR.
Conclusion: Our study, which used a large sample of patients, demonstrates the power of leveraging the EHR to identify factors that modulate risk for developing HTN among patients with OSA. In addition, we described differences between the true diagnosis dates of OSA and HTN and diagnosis dates based on our EHR-based algorithm. Overall, this study provides new insights into disease heterogeneity and potential personalized medicine approaches.
Support (if any):

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0856

ASSOCIATION OF NATURALLY OCCURRING MILD INTERMITTENT HYPOXEMIA AND HEALTH OUTCOMES IN SLEEP APNEA

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Introduction: Hypoxic conditioning, or the intentional exposure of mild intermittent hypoxia (MIH), has been shown to have protective cardiovascular outcomes. We investigated if naturally occurring MIH exposure during sleep has the same effect as controlled exposure. We hypothesized that larger number of respiratory events with MIH is associated with lower risk of adverse outcomes in OSA participants (apnea-hypopnea index ≥ 5 events/hour).
Methods: Participants from the Sleep and Heart Health Study cohort were analyzed. Respiratory events that were associated with MIH included all those accompanied with a 2-4% desaturation. Those with an oxygen desaturation > 4% were

called non-MIH. For each participant, the frequency of MIH (AHI-MIH) and non-MIH (AHI-nonMIH) were calculated. Participants were categorized into 5 groups: those 1) without OSA (AHI 3% or arousal < 5 events/hour; reference group), 2) with OSA and high AHI-MIH (≥ median) but low AHI-nonMIH (< median), 3) with OSA and low AHI-MIH(< median) but high AHI-nonMIH(≥median), 4) with OSA and low AHI-MIH(< median) and low AHI-nonMIH(< median), and 5) with OSA and high AHI-MIH(≥ median) and high AHI-nonMIH(≥ median). Several logistic regression models examined the subgroups' association with hypertension, diabetes, and Epworth Sleepiness Scale after adjusting for age, gender, race, and body mass index as confounders. In secondary analyses, we adjusted for the "hypoxic burden" as a measure of cumulative event-related intermittent hypoxia.

Results: 5634 participants were analyzed (means and standard deviations – age: 63.1±11.2 years; BMI: 28.2±5.1 kg/m2; gender: 52.5% females; AHI 17.9±16.1 events/hour). Compared to participants without OSA, individuals with low AHI-MIH but high AHI-nonMIH were at increased risk of hypertension (odds ratio [95% Confidence Interval]: 1.57 [1.25-1.96]). This risk was lower in participants with high AHI-MIH and high AHI-nonMIH(1.19 [0.99-1.43]) followed by the high AHI-MIH/low AHI-nonMIH subgroup (1.06 [0.85-1.31]) and the low AHI-MIH/low AHI-nonMIH subgroup (0.97 [0.82-1.15]). Similar findings were observed for diabetes and sleepiness. After adding hypoxic burden, hazards ratios were reduced, but the same pattern was observed across these groups for all outcomes.

Conclusion: Presence of MIH events appear to dilute health outcome risks associated with more severe desaturation events. This warrants further investigation to the role of MIH during sleep.

Support (if any):

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0857

EVIDENCE FOR AN INDEPENDENT ASSOCIATION OF CARDIOVASCULAR DISEASE IN PATIENTS WITH NARCOLEPSY

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Introduction: Narcolepsy is a lifelong disabling disorder causing profound daytime sleepiness. Symptoms present as early as childhood and result in marked disturbances in the life course of many persons with narcolepsy (PWN). Further, PWN experience several health conditions, including cardiovascular disease (CVD). Importantly, PWN often present with several co-occurring sleep disorders, including obstructive sleep apnea, which is a prominent risk factor for CVD. This study examined the association between narcolepsy and CVD comprehensively accounting for potential confounders predisposing PWN to CVD.

Methods: This retrospective cohort study used the 2005-2021 IBM® MarketScan® Commercial and Medicare supplemental databases to identify newly diagnosed PWN from at minimum 2 outpatient claims using the International Classification of Diseases–Clinical Modification (ICD-9/10-CM) diagnosis codes. In addition, we identified a comparison cohort of persons without narcolepsy or other hypersomnolent disorders, using propensity score (PS) matching [1: up to 3 ratios] to balance groups based on underlying demographics, the presence of relevant health conditions, including sleep apnea and diabetes, and other confounders. Using Cox proportional hazard regression, we calculated hazard ratios (HR) with 95% confidence intervals (95%CI) to estimate CVD risk outcomes (including major adverse cardiovascular events [MACE], heart failure, stroke, atrial fibrillation, and myocardial infarction [MI]) for PWN compared to non-narcolepsy. Patients were censored at the end of enrollment or up to December 13, 2021.

Results: Among 134,067 patients included (mean age=40±16.8 years; 62% female), 34,562 were PWN and 100,405 were matched non-narcolepsy patients. Compared to non-narcolepsy patients, PWN were associated with a 77% increased risk of any CVD (HR=1.77, 95%CI=1.65-1.89) and an 82% increased risk of MACE (HR=1.82, 95%CI=1.66-1.99). PWN also were associated with an increased risk of heart failure (HR=1.64, 95%CI=1.47-1.83), any stroke (HR=2.04, 95%CI=1.82-2.29), atrial fibrillation (HR=1.58, 95%CI=1.40-1.77), and MI (HR=1.64, 95%CI=1.37-1.96) compared to non-narcolepsy patients.

Conclusion: Using a large representative commercial insurance claims database, our study provides evidence that narcolepsy is an independent risk factor of CVD after comprehensive matching and adjustment for relevant confounders, including sleep apnea.

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0858

A PREDICTIVE MODEL OF COMPOSITE SLEEP HEALTH FOR CARDIOVASCULAR DISEASE BASED ON THE RU-SATED FRAMEWORK

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Introduction: Sleep health is a multidimensional construct. Previous studies have focused on single dimensions of sleep health and their association with cardiovascular disease (CVD). This study aimed to generate a composite multidimensional sleep health (MSH) score by combining subjective and objective measurements of sleep based on the RU-SATED framework, which consisted of Regularity, Satisfaction, Alertness, Timing, Efficiency, and Duration, and examine the association between the composite MSH score and the prevalence of CVD.

Methods: This was a secondary analysis using data from the multicenter, prospective, population-based Hispanic Community Health Study/Study of Latinos (HCHS/SOL). A total of 1,912 participants with complete baseline and actigraphy data were included in the analysis. The primary outcome was the prevalence of CVD, defined as self-reported coronary heart disease or stroke. Covariates included demographics (age, gender, education, and income) and major CVD risk factors (hypertension, dyslipidemia, diabetes, obesity, and smoking). Each domain in RU-SATED framework was measured using both self-reported questions and actigraphy, and converted to binary values with unfavorable conditions coded as 1. Receiver operating

characteristic (ROC) curve was used to select the measurements with higher predictive accuracy for each domain. The composite MSH score was obtained by summing the scores from each single domain. Logistic regression analyses were performed to analyze the relationship between the composite MSH score and CVD prevalence.
Results: Subjectively measured sleep efficiency, timing, alertness, and satisfaction showed higher predictive values for CVD, and actigraphy-measured sleep duration and regularity were associated with better predictive performance. The odds ratio of the composite MSH associated with CVD was 1.261-fold (95% CI 1.060-1.500, p=0.009) after adjusting for covariates. Neither standalone subjective measures nor actigraphy measures of MSH were able to uncover this relationship (OR=1.161, 95% CI 0.978-1.378; OR=1.152, 95% CI 0.966-1.374).
Conclusion: In this study, actigraphy-measured or subjectively measured MSH did not predict the prevalence of CVD independently, whereas the composite MSH combined actigraphy-measured and subjective measurements could predict the prevalence of CVD. The results have inspired us to further explore standardized methods and reach a consensus in measuring MSH, using the RU-SATED framework as a guide.
Support (if any):

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0859

IMPACT OF SOCIAL DETERMINANTS OF HEALTH AND SLEEP ON CARDIOMETABOLIC HEALTH IN PREGNANT AFRICAN AMERICAN WOMEN

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Introduction: Cardiometabolic Disease disproportionately impacts African American (AA) women with higher gestational diabetes risk compared to their White counterparts, often progressing to post-partum type 2 diabetes across the United States. Thus, pregnancy is a critical period to assess cardiometabolic health (CMH) in this population. This study aimed to explore the impact of Social Determinants of Health (SDoH) and sleep-related outcomes on insulin resistance.
Methods: Data from 70 AA pregnant women enrolled in the BETTER lifestyle counseling study (NCT05234125) who completed surveys and provided blood samples were analyzed. SDoH factors encompassed stress level (Perceived Stress Scale), social support perceptions (Multidimensional Scale of Perceived Social Support), and demographic indicators such as income and education. Sleep assessments included evaluations of sleep quality (Pittsburgh Sleep Quality Index), sleep apnea risk measuring the apnea-hypopnea index (Watch-PAT One), insomnia symptoms (Insomnia Severity Index), and sleep hygiene (Sleep Hygiene Index). Insulin resistance was quantified using the Homeostatic Model Assessment of Insulin Resistance (HOMA-IR) as the outcome variable. Multiple regression analyses including demographic variables with a p< 0.2 in bivariate analyses were performed to determine the predictive capacity of SDoH and sleep variables on HOMA-IR.
Results: The mean age was 30.4 (SD 5.72; range:18.5-42 years); mean gestational weeks (GWs) was 18.03 (SD 3.021; range:10.6-23.1); and mean body mass index (BMI) was 33.09 kg/m2 (SD 5.63; range:16.2-47.1). After controlling for covariates (age, GWs, BMI, income, and education), higher stress (β=.251, p<.05), poor sleep quality (β=.279, p<.05), and higher insomnia symptoms (β=.248, p<.05) were significantly associated with higher insulin resistance. These results contribute important insights into the impact of both SDoH and sleep-related outcomes on insulin resistance among AA women during pregnancy.
Conclusion: SDoH and sleep, particularly stress and sleep disturbances, are linked to CMH, highlighting the importance of comprehensive assessment to address cardiometabolic disease risks for AA women during their pregnancy. Further research is needed to understand the causal aspects of these associations and develop targeted interventions to optimize the CMH, and enhance maternal and child health outcomes in this population.
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0860

SLEEP FRAGMENTATION IS A ROBUST INDEPENDENT PREDICTOR OF DIASTOLIC BP AMONG BLACKS IN A REAL-WORLD CONTEXT

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Introduction: Sleep quality is a critical determinant of cardiovascular health, and its influence on blood pressure regulation has been extensively explored. However, there remains a notable gap in research concerning the relationship between sleep fragmentation and blood pressure among Black in a naturalistic setting.
Methods: A total of 195 Black adult participants (75% Female; mean age 48 years) were enrolled in the NIH-funded ESSENTIAL and MOSAIC studies and underwent a 7-day home-based sleep study. Sleep fragmentation, a key variable of interest, was quantified using SleepImage ring devices, which amalgamate various cardiopulmonary disturbance metrics into a comprehensive Sleep Fragmentation score. Diastolic blood pressure (DBP) was measured six times during the study using the iHealth BP monitor, and the average DBP was employed in our subsequent analyses. Our research approach encompassed t-tests and correlation matrices to explore the associations between DBP and a wide array of factors, including sociodemographic characteristics, cardiovascular disease risk diagnosis, age, sleep fragmentation, psychosocial factors, and health behaviors.
Results: The results of our regression analysis revealed several important findings. Age exhibited a small positive coefficient but was not statistically significant, indicating a weak association with DBP. Depression, while displaying a positive coefficient, was marginally significant (p = 0.056), suggesting a potential moderate impact on DBP. Similarly, alcohol consumption exhibited a positive coefficient, marginally significant (p = 0.051), implying a potential moderate effect on DBP. However, the most striking finding was the robust association between sleep fragmentation and DBP. Sleep fragmentation exhibited a positive coefficient (B = 0.303) and was statistically significant (p = 0.005), firmly establishing it as the strongest independent predictor of diastolic blood pressure among Black adults.
Conclusion: This study contributes valuable insights into the relationship between sleep fragmentation and diastolic blood

pressure among Black individuals, in a real-world context. Our findings underscore the significance of addressing sleep quality and fragmentation as a potential modifiable risk factor in cardiovascular health management, particularly within Black communities. Further research in this area may have implications for targeted interventions and strategies to mitigate the adverse cardiovascular effects of sleep fragmentation among at-risk populations.

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0861

BEAT RIGHT, SLEEP TIGHT: PILOT STUDY OF DEPRESSION'S ROLE ON BLOOD PRESSURE AND SLEEP IN OLDER ADULTS WITH INSOMNIA

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Introduction: Insomnia disorder and hypertension are common in aging adults, making older adults at increased risk for cardiovascular disease. A bidirectional relationship between insomnia symptoms and hypertension exists, but mechanisms underlying this association are not fully understood. Depressive symptoms have been linked to insomnia. Additionally, there is a known association between depression and hypertension, but investigations of non-invasive blood pressure metrics are limited, which limits conclusions regarding disease markers and potential targets for intervention. This pilot study tested whether blood pressure interacted with depressive symptoms in its association with sleep in older adults with insomnia.

Methods: Older adults with insomnia disorder (DSM-5 criteria plus sleep diary confirmation of >30 minutes of sleep onset latency or wake time after sleep onset 3+ nights/7; N=38, Mage=68.5±6.4 years, 24 women) completed the Beck Depression Inventory-II (BDI-II), Insomnia Severity Index (ISI), and resting blood pressure reading. Multiple linear regressions tested if cardiovascular activity [pulse pressure (systolic BP – diastolic BP), systolic BP, diastolic BP] interacted with depressive symptoms in its association with insomnia severity, controlling for Body Mass Index and number of medications.

Results: Depressive symptoms interacted with systolic BP in its association with ISI (R2-change=.08, p=.02). Specifically, higher systolic BP was associated with worse insomnia severity only at highest levels of depression (BDI-II score=14.61; B=.12, p=.03).

Conclusion: Preliminary findings suggest higher levels of depression may exacerbate the relationship between higher systolic blood pressure and more severe insomnia symptoms in older adults. These results point to a dynamic interplay between autonomic nervous system dysregulation, peripheral vasoconstriction, and potentially neural circuits involved in emotional processing that mediate depressive symptoms. Prospective studies in larger samples are needed to untangle the temporal nature of this relationship. Additionally, it may be important to concurrently monitor depressive symptoms and blood pressure in older adulthood as well as evaluate whether behavioral interventions in depression (e.g., Cognitive Behavioral Therapy for Depression) may reduce systolic blood pressure and in turn improve insomnia severity in older adults.

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0862

ASSOCIATIONS BETWEEN DAILY FLUCTUATIONS IN SLEEP AND BLOOD PRESSURE AMONG THOSE WITH AND WITHOUT INSOMNIA

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Introduction: Hypertension is a major contributing factor for heart disease, with nearly half of US adults meeting criteria. While studies have begun to examine the relationship between insomnia and blood pressure (BP), little is still known regarding the relationship between daily fluctuations in sleep and BP. This study aimed to provide further clarification on the role insomnia plays in the development of hypertension, including the impact that daily fluctuations in sleep have on fluctuations in BP.

Methods: Participants included 61 adults from the greater Northwest Arkansas area (63.9% White, 67.2% Female, 30-79 y) who completed 10 consecutive days of sleep and blood pressure monitoring. Insomnia status was determined by an Insomnia Severity Index (ISI) score of 8 or higher. Sleep was assessed objectively through actigraphy and subjectively through sleep diaries. BP was measured during the morning and evening using an ambulatory BP monitor. Variables examined included actigraphy and diary based total sleep time (TST), total wake time (TWT), and sleep efficiency (SE), as well as morning, evening, and daily systolic and diastolic BP. A series of multiple regressions were used to examine differences in BP between those with and without insomnia. Mixed effects models were used to explore the relationship between deviations in sleep and BP.

Results: Insomnia status was not found to be associated with average systolic or diastolic BP in the morning ($\beta = 0.09$, $p = 0.44$, $\beta = 0.07$, $p = 0.51$), evening ($\beta = 0.15$, $p = 0.20$, $\beta = 0.13$, $p = 0.25$), or daily ($\beta = 0.12$, $p = 0.28$, $\beta = 0.10$, $p = 0.35$). Decreases in actigraphy derived TST were associated with increased next day morning systolic ($\beta = -0.01$, $p < 0.01$) and diastolic ($\beta = -0.01$, $p = 0.02$) BP when controlling for TWT.

Conclusion: The results of this study did not show support for insomnia serving as a predictor for hypertension. However, a nightly increase of total sleep time significantly decreased morning BP on the following day. Additional analyses will further dissect the association between daily fluctuations in sleep and BP.

Support (if any): Graduate-Professional Student Congress Tiffany Marcantonio Research Grant

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0863

SLEEP REGULARITY AND CARDIOVASCULAR HEALTH AMONG U.S. ADULTS

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[1] NIH

Introduction: Connections between sleep and cardiovascular risk and health are reported in adults. The sleep regularity index (SRI), a measure of day-to-day variability in sleep-wake times, has been shown to be associated with cardiovascular risk in older adults. The connection between SRI and cardiovascular health,

the American Heart Association (AHA) derived concept of positive health promotion across the lifespan, has yet to be reported. The aim of this work is to investigate associations between SRI and cardiovascular risk and health.
Methods: Using National Health and Nutrition Examination Survey (NHANES) 2011-2014 data in US adults aged 40-75 years of age who are free of cardiovascular disease, the SRI was calculated from actigraphy across seven days using the ActiGraph model GT3X+, manufactured by ActiGraph of Pensacola, FL. Life's Simple 7 (LS7) and Life's Essential 8 (LE8) scores were calculated based on AHA. The 10-year risk of atherosclerotic cardiovascular disease (ASCVD) was calculated using the pooled cohort equations defined by the American College of Cardiology/AHA guidelines. The four-year interview weight was used for all complex sample analyses. SPSS complex sample general linear models were used to assess the association between SRI, ASCVD score, LE8, LS7, and demographic variables.
Results: Among the NHANES sample (n=5589; 52.8 % female; mean age = 54.5, SE = 0.17), the mean SRI score was 63.0 (SE = 0.52), the average ASCVD score was 0.12 (SE = .003), the mean LE8 and LS7 scores were 57.1 (SE = 0.46) and 6.6 (SE = 0.04). SRI was not significantly related to ASCVD score (β = -0.001, p = .062). Individuals with higher SRI scores reported higher LE8 (β = 0.265, p < .001) and LS7 (β = 0.035, p < .001) scores. After controlling for gender, race ethnicity, household food security, and SNAP participation status, SRI remained as a significant predictor to LE8 (β = 0.219, p < .001) and LS7 (β = 0.029, p <.001
Conclusion: Among U.S. adults aged 40 to 75 years of age, sleep regularity is positively associated with cardiovascular health.
Support (if any):

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0864

SLEEP PRIOR TO CARDIAC ARREST IS ASSOCIATED WITH PHYSICAL HEALTH-RELATED QUALITY OF LIFE EARLY IN RECOVERY

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Introduction: Poor sleep increases risk of sudden cardiac arrest (CA). Survivors of hospital stays experience lasting sleep issues, and poor post-hospitalization sleep is associated with lower health-related quality of life (HRQoL) during recovery. It is unknown, however, whether better pre-CA sleep may serve as a premorbid asset that may prospectively predict HRQoL during early recovery beyond post-CA sleep.
Methods: In this interim analysis of an observational cohort study, 129 CA survivors were recruited from a large urban hospital. Upon discharge, patients reported on sleep in the month before their CA using the Pittsburgh Sleep Quality Index (PSQI). Post-CA physical function regarding activities of daily living was assessed via the Physical Self-Maintenance Scale. Demographic and CA severity variables were collected from medical records. A month later, patients reported on their HRQoL using the 36-item Short Form (SF-36) and post-CA sleep with the PSQI. We hypothesized that worse premorbid sleep quality (global PSQI score) would be associated with worse physical and mental HRQoL component scores (SF-36 PCS and MCS) at 1 month.
Results: Worse premorbid sleep (M = 8.67, SD = 4.03) was associated with worse PCS 1-month post- discharge (B = -0.68, p < .01), after adjusting for sex at birth, age, ethnicity, and time from CA to return of spontaneous circulation, an index of CA severity. Premorbid sleep was still a significant predictor (B = -0.58, p =.02) after adjusting for patients' physical function at discharge and sleep one month later (M = 7.67, SD = 4.62). However, worse premorbid sleep was not significantly associated with worse MCS after adjusting for the same covariates (B = -0.50, p = .07). This remained non-significant controlling for physical function at discharge and sleep quality after a month (B = -0.22, p = .49).
Conclusion: These results suggest that people's sleep before suffering a CA may predict their post-CA physical HRQoL, in ways that are at least partially independent from CA severity, physical function at discharge, and post-CA sleep. Future research should identify mechanisms (e.g., inflammation) by which a reserve of quality sleep improves post-CA physical recovery.
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0865

SLEEP SYMPTOMS ASSOCIATED WITH GLYCOHEMOGLOBIN IN THE GENERAL US POPULATION: DATA FROM NHANES

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Introduction: Previous studies have linked insufficient sleep duration and sleep apnea to the development of Type-2 diabetes but few studies have explored associations between objective diabetes risk and other sleep symptoms in a general population sample.
Methods: Data were obtained from adults age 20 or older from the NHANES 2017-2020 prepandemic waves. Glycohemoglobin (assessed as HbA1c%) was measured using standard procedures on blood specimens obtained from a nationally-representative sample. Sleep symptoms assessed included general daytime sleepiness, sleep disturbance (frequency of difficulty falling asleep or staying asleep or sleeping too much), daytime tiredness, snoring, and choking/gasping during sleep. Linear regression analyses with HbA1c% as dependent variable were weighted using NHANES population weights. Secondary analyses explored whether these relationships depended on a previous diabetes diagnosis.
Results: In population-weighted analyses adjusted for age and sex, elevated A1c% was associated with frequent sleepiness (B=0.16, 95%CI [0.04,0.27]), sleep disturbance (B=0.18, 95%CI [0.09,0.27]), daytime tiredness (B=0.11, 95%CI [0.01,0.21]), snoring (B=0.25, 95%CI [0.17,0.33]), and choking/gasping (B=0.25, 95%CI [0.11,0.39]). After further adjustment for race/ethnicity, education, BMI, smoking, and sedentariness, relationships were still significant but attenuated for sleepiness (B=0.14), sleep disturbance (B=0.13), snoring (B=0.11), and choking/gasping (B=0.15). After final adjustment for sleep duration, relationships were still significant for sleepiness (B=0.13), sleep disturbance (B=0.12), snoring (B=0.11), and choking/gasping (B=0.15). No significant sleep-by-diabetes interactions were found.

Conclusion: General sleep symptoms experienced by many in the population are associated with objective risk for metabolic disease. Sleep health interventions aimed at these symptoms in general population samples may reduce this risk.
Support (if any):

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0866
PREVALENCE OF OBESITY IN OBSTRUCTIVE SLEEP APNEA WITHIN A LARGE COMMUNITY-BASED COHORT OF MIDDLE-AGED/OLDER ADULTS

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Introduction: Obesity is a well-known risk factor for obstructive sleep apnea (OSA), gaining interest due to the global rise in obesity and novel obesity drugs. The rationale behind this lies in the role of obesity in the pathophysiology of OSA. However, many OSA patients are non-obese, and the association between obesity and OSA may vary by age and sex. Past population studies largely reported the prevalence of OSA according to different obesity categories. In this study, we sought to determine the prevalence of obesity across different levels of OSA severity, age, and sex.
Methods: The analytic sample included individuals with OSA from the Sleep Heart Health Study (SHHS). OSA severity was quantified using the apnea-hypopnea index (AHI4; apneas plus hypopneas with at least 4% oxygen desaturation per hour). Individuals were stratified by the severity of OSA (mild: 5≤AHI4< 15; moderate: 15≤AHI4< 30; severe: AHI4≥30 events/hour), body mass index (BMI), age, and sex.
Results: A total of 2950 of 5749 participants in SHHS had OSA (AHI4≥5 events/hour; 1729/788/433 mild/moderate/severe). Of these, 40.6% were female; mean±SD age was 65.3±10.7 years; and median [interquartile range] BMI was 28.8 [25.8; 32.3] kg/m2. For those with any OSA, 60.6% were non-obese (BMI< 30 kg/m2) and 39.4% were obese (BMI≥30 kg/m2). Across OSA severities, 34.1% of mild, 42.6% of moderate and 54.3% of severe OSA were obese. A greater proportion of younger adults (< 65 years) with OSA were obese (48.3%) than older adults (≥65 years) with OSA (30.9%). In older adults 26.7% of mild, 34.5% of moderate and 40.3%of severe OSA were obese. Finally, a greater proportion of females with OSA were obese (43.6%) than males with OSA (36.5%).
Conclusion: The majority of middle-aged/older adults with OSA are non-obese. The association between obesity and OSA varies by age and sex, with a higher prevalence of obesity in younger adults and in females with OSA. Additional analyses of data from the Multi-Ethnic Study of Atherosclerosis, the Osteoporotic Fractures in Men study, and the HypnoLaus study are being conducted to establish the association between OSA and obesity within other community-based samples.
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0867
MACHINE LEARNING ANALYSIS OF POLYSOMNOGRAPHY VARIABLES TO PREDICT HYPERTENSION

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Introduction: Sleep plays an important role in the regulation of blood pressure (BP) and BP variability (BPV), both of which are associated with cardiovascular disease. However, studies in this area have typically focused on a single domain of sleep traits. We aimed to examine whether multidimensional sleep measures incorporating a wide array of polysomnography (PSG) data along with other patient characteristics can be used to predict hypertension and high BPV using a machine learning (ML) approach.
Methods: We retrieved patient characteristics and PSG data from a single academic sleep center. BP data with at least 3 measures within 1 year following PSG were used to determine hypertension (systolic BP ≥130 mmHg or on antihypertension medication) and high BPV (coefficient of variation > 0.1). We used three commonly used supervised ML models including the logistic regression model, random forests, and eXtreme Gradient Boosting (XGBoost) to predict hypertension and high BPV. To improve the model performance by including the most predictive variables, we additionally conducted feature engineering and ran ML models using the selected variables from the process. We employed two variable reduction methods: least absolute shrinkage and selection operator (LASSO) and principal component analysis (PCA).
Results: Among 2,827 patients, 2074 (73.4%) patients had hypertension and 1,188 patients (42%) had the high BPV group. Overall, the three models showed a good performance in predicting hypertension in which XGBoost performed the best in terms of accuracy (0.67 – 0.75), recall (0.72 – 0.96), precision (0.76 – 0.83), and AUC (0.68 – 0.70). Models built with LASSO-selected variables generally performed more favorably than models built with PCA-constructed features. However, the performance of the ML models to predict high BPV was low with an accuracy of 0.56, recall of 0.2, precision of 0.45, and AUC of 0.53 at best.
Conclusion: ML modeling of multiple PSG sleep features along with common patient characteristics was predictive of hypertension in patients undergoing PSG. PSG data may be better utilized in cardiovascular risk assessment beyond its role as a diagnostic tool for OSA assessment.
Support (if any): Engineering in Medicine Grant (University of Virginia)

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0868
CARDIAC REMODELING: APNEA-HYPOPNEA INDEX AS A PREDICTOR FOR CHANGES IN LEFT ATRIAL VOLUME

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Introduction: Left atrial (LA) size and volume are of interest in sleep-disordered breathing (SDB) as they are associated with cardiac arrhythmias. However, whether the apnea-hypopnea index (AHI) predicts LA longitudinal changes over time remains unknown.
Methods: This retrospective cohort study includes adults (≥18 years) without congestive heart failure (CHF) who were referred for a diagnostic in-laboratory polysomnogram (PSG) between January 2019 and March 2020; a baseline echocardiogram within one year of the PSG; and a follow-up echocardiogram more than one year after the initial studies. Clinical, PSG and echocardiographic variables, including LA volume and LA size, were abstracted from the medical record. SDB was classified as absent, mild, moderate, or severe (AHI ≤4.9/h, 5.0-14.9/h, 15.0-29.9/h, and ≥30/h, respectively). Regression models were used to assess the baseline cross-sectional relationships between AHI and LA measures, and the association of baseline AHI with LA changes over time.
Results: We identified 103 patients (58.8% male, median age 66 years (interquartile range, IQR 52-71)) with and without SDB (AHI median 19.9, IQR 7.3 – 35.6). The median time between baseline and follow-up echocardiograms was 3.2 years (IQR 2.3-4.1). AHI was associated with larger LA volume (β=0.64, p=0.0002) and LA size (β=0.08, p=0.04) at baseline. AHI also predicted changes in LA volume over time (β=0.57, p=0.02), but not changes in LA size. A dose-dependent relationship between SDB severity and changes in LA volume was noted: Individuals without OSA demonstrated a slight decrease in LA volume over time (median -7, IQR -36 - -5) whereas those with severe SDB demonstrated an increase in LV volume (median 13, IQR -9 – +18). Individuals with mild/moderate SDB fell between those groups.
Conclusion: Many patients with SDB are at risk for cardiac arrhythmias. Our results indicate that SDB severity at baseline predicts changes in LA volume over time. These findings may help identify patients at risk for LA enlargement and associated arrhythmias, and suggest a potential opportunity for early intervention to decrease cardiovascular risk.
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0869

ASSOCIATION BETWEEN ACCELEROMETER-MEASURED IRREGULAR SLEEP DURATION AND INCIDENCE OF OBESITY IN OLDER ADULTS

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Introduction: Abnormal sleep duration is an established risk factor for obesity. However, the potential adverse effects of sleep's nightly variability, including fluctuations in duration, remain less explored. Irregular sleep duration may increase circadian disruption and subsequently contribute to metabolic alterations, behavioral and mood changes, and obesity development.
Methods: From 2013-2015, a subsample of the UK Biobank (UKB) participants wore accelerometers for a week. Our longitudinal study included 8,438 participants (mean age: 64 years) with ≥5 days of accelerometer data and repeated weight measurements who had BMI< 30 kg/m2 at baseline. Irregular sleep duration was assessed by the within-person standard deviation (SD) of 7-night accelerometer-measured sleep duration. Weight was objectively measured at UKB center visits or extracted from UK general practice records at two timepoints. The baseline measurement was taken in a period spanning from two years before to one year after the accelerometer study. The follow-up measurement was obtained on average 3.6 years after the baseline measurement (interquartile range: 1.8-5.0) and at least 6 months after the accelerometer study. Poisson regression with robust error variance was used to estimate relative risk (RR) for incident obesity (BMI≥30 kg/m2) according to sleep duration-SD categories.
Results: A total of 419 participants developed obesity at the follow-up measurement. Compared with participants with a sleep duration-SD < 30 minutes, the RR (95% CI) for incident obesity was 1.22 (0.86, 1.73) for 31-45 minutes, 1.60 (1.14, 2.26) for 46-60 minutes, and 2.01 (1.45, 2.80) for >60 minutes (p-trend=0.0024), after adjusting for age, sex, race, and follow-up period. Additional adjustment for lifestyle (smoking, physical activity, diet, and alcohol use), co-morbidities (dyslipidemia, hypertension, and depression), and other sleep-related factors including average sleep duration resulted in a weaker but statistically significant association (RR comparing >60 versus < 30 min: 1.73; 95% CI: 1.24, 2.41). The association was similar in men and women (P-interaction in the fully-adjusted model=0.84).
Conclusion: Irregular sleep duration was associated with higher risk of incident obesity in older adults, independent of average sleep duration and other obesogenic behaviors.
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0870

ASSOCIATION BETWEEN NARCOLEPSY AND CARDIOVASCULAR OUTCOMES: A MATCHED COHORT STUDY ADJUSTING FOR MEDICATION USE

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Introduction: Emerging research suggests that narcolepsy, a chronic disabling condition characterized by excessive daytime sleepiness, directly impacts the cardiovascular system, leading to increased risk of cardiovascular disease (CVD). Existing studies evaluating CVD risk among persons with narcolepsy (PWN) have not considered medications to treat the symptoms of narcolepsy (e.g., stimulants). We aimed to assess the real-world association of narcolepsy with CVD risk while accounting for medications.
Methods: We conducted a retrospective cohort study using 2005-2021 MarketScan® Commercial and Medicare Supplemental databases. Patients with newly diagnosed narcolepsy with □2 outpatient claims identified using International Classification of Diseases – Clinical Modification diagnosis codes were included (narcolepsy group). A comparison cohort of patients without narcolepsy and hypersomnia (non-narcolepsy group)

was matched at a ratio of 1 up to 3 using propensity score (PS) matching based on baseline demographics, comorbidities, and medication use. After PS matching, we used multivariable Cox regression to compare the risks of CVD (i-e., stroke, atrial fibrillation, heart failure (HF), myocardial infarction (MI), or acute coronary syndrome) and major adverse cardiac events (MACE) (i-e., MI, ischemic stroke, HF, acute coronary syndrome, coronary artery bypass grafting, or percutaneous coronary intervention) between the two groups after controlling for baseline wake promoting agents and stimulants use, and post-index time-varying stimulants use. Follow-up continued until the occurrence of outcomes, end of enrollment, or December 31, 2021.
Results: 134,967 patients (34,562 PWN and 100,405 non-narcolepsy; mean age 40±16.78 years and 62% female) were identified. The crude incidence of CVD was 1.50 and 0.85 per 100 person-years for narcolepsy and non-narcolepsy groups, respectively. After controlling for baseline and time-varying covariates, PWN was associated with a 93% higher CVD risk compared to non-narcolepsy group (adjusted hazard ratio (aHR), 1.93; 95% confidence interval (95% CI), 1.75-2.13). Similarly, PWN was associated with a 97% higher MACE risk compared to non-narcolepsy group (aHR,1.97; 95%CI, 1.72-2.26).
Conclusion: In this PS-matched cohort study, PWN experienced increased risk of developing CVD or MACE relative to propensity-matched patients without narcolepsy after controlling for baseline medication use (stimulant and wake promoting agent), and post-index time-varying stimulant use.
Support (if any): Sleep Research Society Foundation (23-FRA-001).

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0871
SLEEP DISTURBANCE AND DISABILITY SEVERITY AFTER STROKE HOSPITALIZATION

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Introduction: Stroke survivors frequently report sleep disturbance and feelings of not being back to where they were, physically, prior to their event. Post-stroke sleep disturbance may be a factor related to sub-optimal recovery.
Methods: Data came from the Reactions to Acute Care and Hospitalizations (ReACH) Stroke-Sleep Study, an observational cohort assessing the relationship of sleep with secondary cardiovascular risk in the year following stroke or transient ischemic attack (TIA). Data were collected using self-reported questionnaires at 1 month and chart reviews. Sleep quality was assessed with the Pittsburgh Sleep Quality Index (PSQI), with a score >5 indicating poor sleep quality. Insomnia symptoms were assessed with a single item from the Posttraumatic Stress Disorder Checklist for DSM-5 (PCL-5): "In the past month, how much were you bothered by trouble falling or staying asleep?" with a rating of "moderately," "quite a bit," or "extremely" indicating presence of insomnia symptoms. Degree of disability was assessed using the Simplified Modified Rankin Scale Questionnaire (smRSq), with presence of disability defined as smRSq score >2. Binary logistic regression was used to analyze the relationships between presence of poor sleep and insomnia, separately, with presence of disability at 1-month post-hospitalization. Analyses were adjusted for age, gender, race/ethnicity, and stroke severity (NIH Stroke Scale).
Results: The sample included n=436 participants (mean [SD] age=60.2 [15.5] y, 52% Hispanic/Latino, 59% female). Fifty-six percent of participants reported poor sleep quality, 27% reported presence of insomnia symptoms, and 23% reported presence of disability at 1 month. Poor global sleep quality (vs. good sleep) was significantly associated with presence of disability (adjusted OR: 2.45, 95% CI: 1.48-4.04, p< 0.001). Insomnia (vs. no or mild symptoms) was also significantly associated with presence of disability (adjusted OR: 2.40, 95% CI: 1.50-3.85, p< 0.001).
Conclusion: More than half of participants reported poor sleep quality, and over a quarter reported insomnia symptoms, 1 month after stroke hospitalization. Compared to those without sleep problems, individuals with sleep disturbance had nearly 2.5 times higher odds of disability. While causal relationships cannot be concluded based on this cross-sectional analysis, findings suggest that sleep may play a role in stroke survivors' outcomes and recovery.
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0872
SLEEP-DISORDERED BREATHING IS ASSOCIATED WITH ENDOTHELIAL DYSFUNCTION IN ADULTS

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Introduction: Short sleep duration and obstructive sleep apnea (OSA) are associated with increased rates of cardiovascular disease. Vascular inflammation and endothelial dysfunction are potential mechanisms for this association but can be burdensome or impractical to measure in clinical settings. Other characteristics of sleep health, such as sleep quality, insomnia symptoms, and daytime sleepiness, are infrequently studied in relation to endothelial function. The current study investigated the association between multiple dimensions of sleep health (apnea hypopnea index (AHI), insomnia symptoms, sleep quality, and daytime sleepiness) and endothelial dysfunction using peripheral arterial tonometry (PAT; EndoPAT, Itamar Medical).
Methods: Participants (N=43) with mild-to-moderate OSA, completed a baseline assessment including demographics, Insomnia Severity Index (ISI), Pittsburgh Sleep Quality Index (PSQI), and Epworth Sleepiness Scale (ESS). OSA severity was measured with AHI from one night of PSG (home or in-lab). Microvascular endothelial function was assessed using EndoPAT. The hyperemic response was measured following upper arm occlusion and the reactive hyperemia index (RHI) was calculated. Cross-sectional associations of sleep (ISI, PSQI, ESS, AHI), demographic characteristics (age, sex) and BMI with the natural log of RHI (used due to non-normality) were examined using linear regression models.
Results: In the study sample, mean (SD) age = 54.4 (12.6) years, 63% were female and 77% identified as Black race. Higher AHI (b = -.015. SE = .01, p =.03) and older age (b = -.01. SE = .003,

p =.005) were significantly associated with lower RHI, indicating worse endothelial function. ISI, PSQI, ESS, sex, and BMI were not significantly associated with RHI (p's>.05).
Conclusion: This study identified an association between OSA severity (higher AHI) and greater endothelial dysfunction, using the novel non-invasive EndoPAT, and null associations with other self-reported sleep characteristics. The study was underpowered to include covariate adjustment or interaction terms, but future studies with larger samples and studies examining potential benefits of OSA treatment on endothelial function are needed.
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0873
IMPACT OF OBSTRUCTIVE SLEEP APNEA TREATMENT ON MORTALITY IN ATRIAL FIBRILLATION PATIENTS

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Introduction: The intricate relationship between atrial fibrillation (AF) and obstructive sleep apnea (OSA) has garnered attention due to its potential impact on morbidity and mortality. This study explores the characteristics of individuals with both AF and OSA, aiming to shed light on associated outcomes.
Methods: Utilizing data from the Geisinger Health System (2007-2023), we focused on cardiology patients with AF. Inclusion criteria comprised age > 18, AF and OSA diagnosis, and polysomnography with an apnea-hypopnea index (AHI) > 5. Data collected included age, gender, body mass index (BMI), mean AHI, oxygen desaturation index (ODI), ablation, cardioversion rates, and electrophysiology (EP) clinic follow-ups.
Results: Among 29,000 patient encounters, 2,971 unique patients met inclusion criteria. 64% were male, with a mean age of 74.9 for deceased patients versus 68.1 for the alive cohort ($p < 0.001$). Deceased patients had a higher mean BMI (35.8 vs. 34.3, $p = 0.003$) and AHI (27 vs. 25, $p = 0.0143$). Oxygen desaturation was observed in 34% of deceased patients compared to 28% in the alive cohort ($p < 0.0001$). Ablation and cardioversion did not significantly impact mortality. The all-cause mortality rate was 12.7%.
Conclusion: Analysis revealed that prolonged hypoxia increased mortality risk in AF and OSA patients. Although higher AHI was noted in deceased patients, its clinical significance was limited. We also found that ablation and cardioversion did not improve mortality. Effective OSA treatment in AF patients can potentially improve outcomes. Further studies are necessary to determine if reducing oxygen burden reduces mortality in this population.
Support (if any): A study published in the American Journal of Respiratory and Critical Care Medicine found that CPAP therapy reduced the incidence of AF-related mortality. The data from over 10,000 patients, demonstrated that those receiving effective sleep apnea interventions, such as CPAP, exhibited a 35% reduction in all-cause mortality compared to untreated counterparts. This research highlights the potential life-saving benefits of addressing sleep-disordered breathing in the management of AF.

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0874
IMPACT OF PHYSICAL ACTIVITY ON SUBSEQUENT NIGHT'S SLEEP IN PATIENTS AFTER CARDIAC SURGERY

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Introduction: After cardiac surgery, patients often experience sleep disturbances, including poor sleep quality and increased awakenings. Sleep benefits postoperative physical function and overall recovery and has been related to physical activity. Physical activity and sleep have daily variations, but no study has examined their relationships on a daily basis after cardiac surgery. To address this gap, we investigated the effects of daily physical activity on daily sleep in postsurgical cardiac patients.
Methods: Employing a longitudinal pilot study design, 33 adults aged 18 to 80 who had undergone cardiac surgery were recruited from one hospital in Chicago and using an online recruitment site. Daily physical activity and sleep were measured in participants' homes using a wrist-worn ActiGraph over 7 days and nights. Sociodemographic and psychosocial factors were assessed through self-reported online questionnaires. Mixed-effects model analyses were applied to examine the effects of daily physical activity on five sleep variables; covariates were selected from bivariate correlational and regression analyses as well as previous research evidence.
Results: Participants were mostly male (57.6%), non-Hispanic whites (63.6%) and had a mean age of 60.8 ± 10.1 years. Their mean body mass index (BMI) indicated overweight (28.4 ± 5.2 kg/m2), and 54.6% had undergone coronary artery bypass graft surgery 85.7 ± 91.2 months earlier. In mixed-effects model analyses, higher moderate-to-vigorous physical activity was significantly associated with lower next-day sleep latency ($b=-1.32$, $p<.05$). Among covariates, lower depression ($b=2.72$, $p<.05$), higher companionship ($b=0.37$, $p<.05$), and higher instrumental support ($b=2.40$, $p<.05$) were associated with lower daily wake after sleep onset, increased daily sleep efficiency, and longer total sleep time, respectively. In addition, older age, higher BMI, and a higher comorbidity index predicted more daily sleep disturbances.
Conclusion: In postsurgical cardiac patients, daily physical activity should be assessed and managed as a means to enhance daily sleep. Tailoring sleep interventions to individuals based on their comorbidities and psychosocial factors is also important. Future research should explore interactions between daily physical activity and sleep in a larger sample of postsurgical cardiac patients during varying time periods after surgery and should comprehensively assess sleep status, including sleep disorders, daytime napping, and daytime sleepiness.
Support (if any):

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0875
THE IMPACT OF NON-COMPLIANCE WITH CPAP THERAPY ON MORTALITY IN ATRIAL FIBRILLATION PATIENTS

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Introduction: Atrial Fibrillation (AF) patients commonly experience comorbidities such as sleep apnea, emphasizing the need for effective management strategies. This study investigates the association between non-compliance with Continuous Positive Airway Pressure (CPAP) therapy and increased mortality in AF patients.
Methods: Utilizing data from the Geisinger Health System (2007-2023), we focused on cardiology patients with AF. Inclusion criteria comprised age > 18, AF and OSA diagnosis, and polysomnography with an apnea-hypopnea index (AHI) > 5. Data collected included age, gender, body mass index (BMI), mean AHI, adherence within 1st three months of starting CPAP therapy, Medicare adherence percentage, and CAI.
Results: Among 29,000 patient encounters, 2,971 unique patients met inclusion criteria. We chart reviewed 100 patients by looking at compliance reports within the first three months of CPAP use. Mean adherence time within the first three months was 5 hours 39 minutes for the alive cohort vs 4 hours 9 minutes for the patients that died (p=0.02). Mean Medicare medical adherence percentage for alive cohort was 73% vs 71% for the patients that died (p=0.361). Deceased patients had higher association of having AHI > 5 (p=0.016). Mean CAI for the alive cohort was 0.81 vs 0.62 for the deceased cohort (p=0.912). All-cause mortality rate was 12.7%.
Conclusion: Our findings underscore the critical impact of CPAP compliance on mortality outcomes in AF patients. Non-compliance with CPAP therapy within the first three months of use and AHI >5 emerged as a significant predictor of increased mortality, emphasizing the need for targeted interventions to enhance adherence in this population. The implications of our study extend beyond mortality, encompassing broader cardiovascular outcomes and healthcare utilization. Studies have established the relationship between AF and sleep apnea. Sleep apnea, prevalent in up to 50% of AF patients, exacerbates the arrhythmia's progression and increases the risk of cardiovascular events. While CPAP therapy has demonstrated efficacy in ameliorating the cardiovascular impact of sleep apnea, limited research has explored its effect on mortality in AF patients. Studies examining CPAP therapy's impact on AF outcomes have primarily focused on surrogate markers such as AF recurrence and symptom severity.
Support (if any):

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0876

OBSTRUCTIVE SLEEP APNEA IS ASSOCIATED WITH POOR CARDIOMETABOLIC MARKERS IN TYPE 1 DIABETES

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Introduction: In patients with Type 2 diabetes (T2D), obstructive sleep apnea (OSA) is associated with worse cardiometabolic risk factors. Whether the same occur in Type 1 Diabetes (T1DM) has not been well established.
Methods: Retrospective cross-sectional study, we assessed T1D patients from our endocrinology clinic between 2015-2022, who had a sleep study done in the Sleep Center. We compared the groups for diabetes duration, glycemic control, complications, and metabolic profile. An unpaired t-test was performed for comparison of means, chi-square test for nominal data, and a p-value of P< 0.05 was considered statistically significant.
Results: We identified 55 patients with T1D and a sleep study, 33 had OSA based on sleep report and 22 did not. Both groups had similar diabetes duration, BMI, micro and macrovascular complications. Hypertension and dyslipidemia were more frequent in the OSA group (P< 0.05). A1C values were similar between OSA and non-OSA groups (7.5% vs 7.9%). Total daily insulin dose per kilogram was similar too (0.42 vs 0.30). Of the 14 patients with a follow up visit after initiation of PAP therapy, A1c levels remained unchanged before and 3-6 months after PAP initiation (7.7% vs. 7.0%, P=0.25), however, 57% of them improved their A1c level, and only 21% worsened. The OSA group had higher triglycerides (mean 142mg/dl vs 81.7mg/dl, P=0.003) and lower HDL (mean 44.5mg/dl vs 62.7mg/dl, P=0.06) despite similar A1c levels. In terms of liver fibrosis, an FIB-4 score < 1.3 was considered low risk based on ADA guidelines, and we found 14 out of 33 patients in the OSA group (42%) and 4 out of 22 patients in the non-OSA group (18%) had >1.3, (P=0.06).
Conclusion: In patients with T1DM, OSA is associated with metabolic features consistent with insulin resistance: trends towards higher BMI, insulin needs and worse lipid profile, despite similar A1c levels. The glycemic impact of OSA treatment in T1DM requires further investigation.
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0877

SLEEP QUALITY AND DYSLIPIDEMIA AMONG YOUNG AND MIDLIFE WOMEN

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Introduction: Sleep quality is associated with poor cardiometabolic health in women and men. However, these associations have been infrequently reported among young and midlife women. Therefore, we examined the influence of poor sleep quality on dyslipidemia in a cohort of women from Michigan.
Methods: We utilized the POUCHmoms Study, a large and socioeconomically diverse community-based cohort of 648 young and midlife women from five Michigan communities. Sleep quality was evaluated using the Pittsburgh Sleep Quality Index (PSQI), a widely used self-report questionnaire with 19 dimensions of sleep. A score >5 on the PSQI was considered indicative of poor sleep quality. Fasting lipids levels were assessed in plasma for all women. Based on clinical guidelines for dyslipidemia, we classified women by high and low lipid levels; High-density lipoprotein < 40 mg/dl, Low-density lipoprotein>160 mg/dl, Total Cholesterol >240mg/dl, Triglycerides>200mg/dl. Health, sociodemographic and lifestyle information was collected through questionnaires. Next, we grouped women by low and elevated (borderline/high) lipids levels and examined associations with poor sleep quality. Bivariate analysis was used for determining the association between the lipid levels with covariates of interest. Logistic regression models, adjusting for sociodemographic,

health and lifestyle characteristics, were utilized to assess the association between poor sleep quality and dyslipidemia.
Results: Women in this cohort had a mean age of 38y and 68% were white. More than half (60%) reported poor sleep quality. The prevalence of low HDL and high total cholesterol was 41% and 30% respectively. Women with poor sleep quality were more likely to have low HDL (adjusted OR=3.17, 95% CI: 1.78, 6.96) than women with good sleep quality. Associations of poor sleep quality with high levels of triglycerides, LDL, and total cholesterol were not statistically significant. However, when we grouped women by elevated/high levels, we found that high triglycerides and low HDL levels were associated with poor sleep quality (adjusted OR=1.94, 95% CI: 1.06, 3.54) and (adjusted OR=2.65, 95% CI: 1.71, 4.12), respectively.
Conclusion: In this cohort of young and midlife women, we found significant associations between poor sleep quality, high triglycerides, and low HDL. These findings highlight the potential influence of sleep quality on cardiovascular function among women.
Support (if any):

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0878

PARTICULATE MATTER EXPOSURE IS A DRIVING FACTOR OF OXYGEN DESATURATION IN BLACKS WITH CENTRAL SLEEP APNEA

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Introduction: Exposure to particulate matter (PM) in the home environment is a modifiable risk factor for oxidative stress, a common and burdensome symptom of Central Sleep Apnea (CSA), a condition characterized by the brain temporarily not sending signals to the muscles that control breathing during sleep. Although previous research has established a greater likelihood of adverse health outcomes given environmental exposure, the effects of specific air pollutants have not been distinguished from other neighborhood factors. Moreover, recommendations to reduce exposure to PM have not been included in CSA treatment. This study aims to contribute to the development of predictive models that account for the impact of environment on severity of CSA symptoms among Black Americans.
Methods: Data were collected from 168 Blacks (69% female and 31% male, Mage 47.60 ±16.459yrs) that were enrolled in two NIH-funded community-based sleep studies, ESSENTIAL and MOSAIC. Sleep environment PM levels were assessed objectively with the IQAir device for a period of 7 days. During the same period, SleepImage ring devices were used to measure the number of paused breathing events during a sleep period and a score was generated based on the qualifying events of oxygen desaturation. Analyses of correlation matrices were conducted to explore the associations between CSA and PM exposure. Descriptive statistics were analyzed, and a regression analysis was performed to understand the association between CSA and PM. Analyses were performed using SPSS29.
Results: Exposure to PM 2.5 (fine inhalable particles with diameters measuring 2.5 micrometers and smaller) was highly correlated with Central Sleep Apnea (sAHI Central), with at least 10 qualifying events of 3% oxygen desaturation (r(165)=.465,p<.001) and 4% oxygen desaturation (r(165)=.473,p=<.001) during a sleep period. Regression analysis further revealed significant association between PM 2.5 and sAHI Central [β= .032; p< .001]. The model adjusted for age, sex, and an existing Sleep Apnea diagnosis.
Conclusion: Findings suggest that exposure to PM is a driving factor in oxygen desaturation in Blacks. These findings present an opportunity to influence population health by contextualizing the relationship between CSA and environmental factors among Black Americans.
Support (if any): R01AG067523, R01HL142066, and T32HL166609-02

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0879

INVESTIGATING FAMILY SLEEP HEALTH IN NATIVE HAWAIIAN AND PACIFIC ISLANDER COMMUNITIES

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Introduction: Native Hawaiian/Pacific Islander (NHPI) populations have significantly elevated risk for cardiometabolic diseases, which are linked mechanistically to sleep deficiencies. Research suggests that sleep deficiencies are highly prevalent among NHPI adults, including short sleep, insomnia symptoms, and elevated risk factors for OSA (obesity). Although adult sleep practices often begin during childhood, little research has examined sleep among NHPI families. As sleep significantly relates to sociocultural factors (stress, socioeconomics, family dynamics), this study aimed to identify sleep health parameters that affect family members' sleep and determine community methods to improve sleep.
Methods: NHPI adolescents and adults(N=34; 33.3% female) from Utah and Hawaii participated in six online focus groups. Discussed sleep-related topics were duration, sufficiency, environment, routines, household rules/dynamics, beliefs/practices, and disorders. Health-related topics discussed included cardiometabolic disease, stress, technology use, work schedules, and health attitudes/goals. Mixed method data were analyzed using constant comparison approach.
Results: Participants (adolescent mean age of 15.3 years; adult mean age of 39.4 years) reported an average household of 5.5 members(73.3% included children). Few participants regularly slept in a different home from family members(13.3%). Reported annual household income was $75,000+ by 48% of participants. Education level was 53.3% GED/high school, 43.3% some college/bachelor's degree, and 3.3% master's degree. Adolescents reported adverse sleep-related factors, including sleep timing, chores, shared sleeping space and noise, sport/school schedules, and sleep insufficiency from homework and sleep onset worry. Adult-focused adverse sleep health repercussions included childcare, temperature, technology use in bed, community/extended family event frequency, financial strain, working multiple jobs, dietary challenges, and social beliefs/practices related to Polynesian culture. Community members identified religious practices, family-driven efforts, changing cultural perception of sleep, and targeting youth as ways to address intergenerational transmission of sleep health values and behaviors.
Conclusion: Findings reveal feasible areas that community members of all ages can utilize to improve sleep health across generations like limit setting at bedtime, utilizing strong community-driven ties (Polynesian cultural values, religious practices), and

enhancing existing familial structure. Future research should address significant barriers to improving sleep health (socioeconomics, environmental influences, extracurricular events, sleep perception) that seem unsurmountable.
Support (if any): Health Studies Fund, Department of Family and Preventive Medicine, University of Utah

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0880
RELATIONSHIPS BETWEEN MULTIMORBIDITY AND DISTURBED SLEEP PHENOTYPES IN CHRONIC SPINAL CORD INJURY

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Introduction: Disturbed sleep is a modifiable risk factor for a variety of co-morbidities. Treatment of sleep disorders can provide a key target for improving cardiometabolic health and overall wellness. Despite evidence suggesting higher prevalence of disturbed sleep in Veterans with spinal cord injury (SCI) compared to the non-injured population, the intersectional effects of sleep-wake disruption remain undefined. The purpose of this study is to examine existing data from the spinal cord injury-pressure injury resource (SCI-PIR) database to assess prevalence and identify relationships among sleep disorders and cardiometabolic risk after spinal cord injury.
Methods: This retrospective longitudinal national database cohort study utilized the VA's SCI-PIR database containing comprehensive clinical data for 29,000 individual Veterans with SCI with over 120,000 encounters. SCI-PIR data includes clinical characteristics of Veterans with SCI, demographics, and comorbidities identified as being relevant to sleep and cardiometabolic risk. We queried the database for ICD9 diagnosis codes related to cardiovascular, metabolic, psychologic, and sleep conditions to identify sleep disorder subgroups defined by clustering of cardiometabolic risk factors and sleep diagnoses within SCI individuals diagnosed with sleep disorders.
Results: In the sample of 18,894 Veterans, sleep disturbances were diagnosed in only 16.25% of the sample. Sleep apnea (6.7%) and insomnia (4.3%) were the most common sleep diagnosis. Correspondence analysis of sleep, cardiac disorders, and other co-morbidities demonstrated two clusters. The first cluster showed a robust link between sleep apnea, hypersomnia, heart failure and arrhythmias, and secondary associations with coronary artery disease, chronic kidney disease, obesity, diabetes, and hyperlipidemia. The second cluster showed a strong relationship between insomnia, anxiety, and post-traumatic stress disorder.
Conclusion: Sleep disturbances are common in Veterans with SCI, but underdiagnosed. Our findings support the link between medical complications and consequences of disturbed sleep and cardiometabolic risk. This will enable development of SCI validated sleep instruments and clinical decision tools that identify those at highest risk for sleep disorders lead to the development of targeted interventions and treatments to advance precision health for Veterans with SCI.
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0881
IMPACT OF STATIN WITHDRAWAL ON SLEEP QUALITY

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Introduction: Statins are benchmark lipid-lowering drugs, reducing blood cholesterol by controlling its synthesis. There are side effects linked to statins use, including statin-associated muscle symptoms (SAMS). These symptoms typically include myalgia, stiffness, weakness, fatigue and/or cramps. SAMS can lead to a reduction in muscle performance, as well as an altered health-related quality of life. Nevertheless, the potential effects of SAMS on sleep remains poorly documented. The objective of this exploratory work was to assess if measures of sleep disturbances and its consequences improve after drug withdrawal in SAMS self-reporters.
Methods: Patients (5 men [M] / 3 women [W], 44.8±6.3 yrs.) in a primary cardiovascular prevention cohort composed two groups: statin users with (SAMS, 2M/2W) or without symptoms (No SAMS, 3M/1W). All patients were required to have a low cardiovascular risk over ten years (i.e. Framingham Risk Score < 10%) and were using different types and doses of statins for more than two months. Sleep was measured objectively by actigraphy and subjectively using the Epworth Sleepiness Scale (ESS) and the Pittsburgh Sleep Quality Index (PSQI). Finally, a 10-point visual analog scale (VAS) was used to self-assess the intensity of SAMS, specifically at night. Measures were taken before and after two months of statins withdrawal.
Results: After withdrawal, we observed an improvement of objective sleep quality in the SAMS group (sleep efficiency: +3.79%, effect size [ES]: 0.33 [small effect]; wake after sleep onset: -15.6%, ES: -0.30 [small effect]; number of awakenings after sleep onset: -12.7%, ES: -0.45 [small effect]), concurrent with a decrease of subjective perception of SAMS intensity at night (VAS, from 4.5 to 1.0, ES: -0.79 [moderate effect]). A decrease of subjective daytime sleepiness (ESS, from 11.3 to 8.3, ES: -0.45 [small effect]) and an increase of subjective sleep quality (PSQI, from 7.66 to 6.33, ES: -0.31 [small effect]) were also seen in this group. On the other hand, the No SAMS group showed no change after drug withdrawal for any of the different objective and subjective sleep parameters (ES: -0.08 to 0.15 [trivial effects]).
Conclusion: Our preliminary data suggest that SAMS are associated with sleep disturbances and impaired sleep quality.
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0882
THE ASSOCIATION BETWEEN OBJECTIVE DAYTIME SLEEPINESS AND GLUCOSE METABOLISM IN OSA PATIENTS: A METABOLOMICS STUDY

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Introduction: Objective, but not subjective excessive daytime sleepiness (EDS) has been proposed to link to cardiometabolic comorbidity in obstructive sleep apnea (OSA). We aimed to examine the joint effect of OSA and objective EDS on glucose metabolism and the underlying mechanisms.
Methods: The multiple sleep latency test (MSLT) and Epworth sleepiness scale (ESS) were used to assess objective and subjective EDS, respectively. Disordered glucose metabolism was defined as either a physician-diagnosis or having fasting blood glucose levels ≥ 5.6 mmol/L. Values of fasting insulin and homeostasis model assessment of insulin resistance (HOMA-IR) higher or equal to the median values of our sample were defined as high fasting insulin and insulin resistance. Serum metabolomics was used to explore the underlying pathways.
Results: Among 114 consecutive OSA patients, lower MSLT values was marginally significantly associated with higher levels of fasting blood glucose (β = −0.181, p = 0.052, poor strength), and significantly associated with insulin (β = −0.308, p = 0.002, fair strength) and HOMA-IR (β = −0.321, p = 0.001, fair strength). Furthermore, objective EDS was significantly associated with increased odds of disordered glucose metabolism (OR = 5.781, 95%CI 1.232 - 27.135), elevated fasting insulin (OR = 4.317, 95%CI 1.357 - 13.731) and insulin resistance (OR = 5.621, 95%CI 1.581 - 19.984). Metabolomics analyses showed that dysregulation of valine-related metabolism linked the association between objective EDS and impaired glucose metabolism in patients with OSA. No association between subjective EDS and impaired glucose metabolism was observed.
Conclusion: OSA with objective, but not subjective EDS is associated with impaired glucose metabolism. Dysregulation of valine-related metabolism may contribute to the association between objective EDS and impaired glucose metabolism in OSA.
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0883

SLEEP AND CIRCADIAN HEALTH, INSULIN SENSITIVITY, AND GLYCEMIC CONTROL IN ADOLESCENTS WITH TYPE 1 DIABETES

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Introduction: Insulin resistance and poor glycemic control are significant risk factors for cardiovascular disease for individuals with type 1 diabetes (T1D). Adolescents with T1D are at heightened risk for poor sleep and circadian health due to behavioral and physiologic aspects of T1D in combination with biological, psychosocial, and environmental factors of adolescence. Emerging evidence suggests an association between sleep and circadian health with insulin sensitivity (SI) and glycemic control among adults with T1D and healthy adolescents, but this has not been explored in adolescents with T1D.
Methods: Twenty-three adolescents with T1D underwent a cross-sectional assessment during the academic year with one week of in-home actigraphy and continuous glucose monitoring (CGM) followed by in-laboratory serial salivary melatonin sampling and hyperinsulinemic-euglycemic clamp. BodPod assessed free-fat mass (FFM). SI was expressed as steady-state glucose infusion rate ("M") in mg/kg/FFM/min. Sleep variability was calculated as the standard deviation of weekday actigraphy-estimated sleep metrics. Duration between dim-light melatonin onset (DLMO) and bedtime was calculated to determine circadian phase angle. Pearson correlations examined associations between sleep and circadian variables with SI and glycemic control.
Results: Adolescents with T1D (age=15.9±1.1 years, 48% female, 91% non-Hispanic White, HbA1c=7.6±1.1%) obtained 6.7±0.8h sleep on weeknights. Greater nightly variability of time in bed (TIB) and sleep midpoint timing across the monitoring period were associated with worse SI (M mg/kg FFM/min; r=-0.43, p=0.045; and r=-0.44, p=0.04, respectively). Greater nightly variability in the duration of wake after sleep onset (WASO) was associated with poorer CGM metrics, including higher mean sensor glucose (r=0.62, p=0.006), less time in range (70-180mg/dL, r=-0.56, p=0.016), and higher standard deviation (r=0.51, p=0.031). A longer duration (wider phase angle) between DLMO and bedtime was associated with a higher CGM coefficient of variation (r=0.91, p=0.002).
Conclusion: Nightly variability in TIB, sleep timing, and WASO, and circadian phase angle may represent contributing mechanisms of poorer SI and glycemic control in adolescents with T1D. Further research is warranted examining the health impact of sleep and circadian health interventions in adolescents with T1D.
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0884

SLOW WAVE SLEEP IS ASSOCIATED WITH GLUCOSE METABOLISM IN OBSTRUCTIVE SLEEP APNEA: A REGISTRY-BASED STUDY

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Introduction: Obstructive sleep apnea (OSA) is a common condition being increasingly recognized and is a known risk factor for cardiovascular and metabolic disease. Impaired sleep architecture and (or) frequent nocturnal hypoxia are characteristic features in patients with OSA. However, little is known about the sleep parameters linking OSA with glucose metabolism. The objective of this study was to evaluate the association between glycated hemoglobin (HbA1c) and sleep traits from polysomnography and subjective sleep diary in a Chinese population with proven OSA (Huashan OSA Registry Study, Hs-OSARS).
Methods: 535 participants were recruited in Huashan OSA Registry Study, from January 2018 to August 2021. Objective sleep characteristics were measured via one-night laboratory PSG and biochemical parameters was tested the next morning. Associations were conducted using Pearson's correlation

with adjustments for age, gender, and body mass index (BMI). Regression was used to investigate predictive power of sleep subscales for glucose levels.
Results: Among the participants, 133 subjects underwent HbA1c and lipid profile (triglyceride, total cholesterol, LDL- and HDL-cholesterol, etc). Age, BMI, ApoE, TC and non-HDL-C (rage=0.281, p=0.001; rBMI =0.249, p=0.004; rApoE=0.250, p=0.004; rTC=0.264, p=0.005; rnon-HDL-C=0.281, p=0.002) had positive associations with HbA1c. Among sleep traits, only stage 3 sleep had a negative association with HbA1c (r=-0.219, p=0.011). After controlling for gender, age and BMI, these associations remained and were statistically significant. Stepwise regression analysis found that non-HDL-C, stage 3 sleep and age were significant predictors retained in the model. Upon fixing the covariates (including gender, age and BMI), TC and stage 3 sleep were significant for predicting HbA1c outcomes.
Conclusion: Insufficient slow wave sleep is associated with higher blood glucose levels. Our study shows that other PSG indices, such as total sleep time, sleep efficiency, arousal index, apnea-hypopnea index and hypoxemic burden, are not associated with HbA1c. These findings highlight the importance for clinicians to evaluate and improve the slow wave sleep as part of preventing glucose metabolism impairment in OSA patients.
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0885

EXPLORING SLEEP HEALTH IN THE CONTEXT OF COPD AND OBESITY: INSIGHTS FROM A POPULATION-BASED CROSS-SECTIONAL STUDY

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Introduction: Many individuals with obstructive lung disease such as COPD suffer from sleep disturbances. Poor sleep quality is related to disease severity. COPD has been associated with obesity in a bidirectional manner, though few studies have examined the interaction between COPD, obesity, and aspects of sleep health including quality and duration. This study aims to examine if decreased sleep duration and trouble sleeping are associated with increased risk of COPD and obesity.
Methods: Using data from three consecutive rounds of the National Health and Nutrition Examination Survey (2013-14, 2015-16, and 2017-18), a cross-sectional analysis was conducted. Sleep quality was assessed through the survey by inquiring if subjects experienced trouble sleeping. Sleep duration was categorized into normal (7-8 hours of sleep), short (< 7 hours of sleep), and long (>8 hours of sleep). Weight was categorized into normal weight, overweight, obese, and severely obese. Poisson regression and multinomial logistic regression analyses were used. Adjusted incidence rate ratio (aIRR) and adjusted relative Risk Ratios (aRRR) with their 95% CI were reported.
Results: The total sample size was 16,939, with females comprising the majority (52%), and ages ranging from 20 to 80 years. Those with COPD were more likely to report trouble sleeping (aIRR 1.48, p < 0.001). Obese and severely obese groups were also associated with trouble sleeping (aIRR 1.27 and 1.50 respectively, p < 0.001). An increased likelihood of trouble sleeping (p < 0.001) was observed among individuals with COPD and overweight (aIRR 1.54), obesity (aIRR 1.89), and severe obesity (aIRR 1.97). COPD was also found independently associated with long sleep duration (IRR 1.50, p < 0.004); however, in the same model, severely obese groups were significantly associated with shorter sleep duration (aRRR: 1.39, p: 0.002).
Conclusion: In the current study, COPD was associated with long sleep duration and trouble sleeping. Increasing obesity was associated with short sleep duration and trouble sleeping, consistent with previous findings that sleep deprivation likely contributes to obesity.
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0886

IMPACT OF MULTIDIMENSIONAL SLEEP HEALTH ON GLYCEMIC CONTROL AND SELF-REPORTED HEALTH OUTCOMES IN TYPE 1 DIABETES

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Introduction: Sleep is important to health in patients with type 1 diabetes (T1D). This study comprehensively explored the impact of individual sleep dimensions, (e.g. satisfaction, alertness, timing, efficiency, duration, and regularity) as well as global multidimensional sleep health (MSH) on glycemic control and other self-reported health outcomes in T1D.
Methods: Data from 118 adults with T1D participating in an ongoing sleep intervention study (NCT04506151) were analyzed. Satisfaction was assessed by the Pittsburgh Sleep Quality Index and alertness by the Epworth Sleepiness Scale. Timing (sleep midpoint), efficiency, duration, and regularity (standard deviation of sleep midpoint) were derived from 7-day actigraphy. A composite MSH score was the sum of "Good" individual sleep health dimensions. Glycemic control was assessed through blinded 7-day continuous glucose monitoring (time-in-range (TIR, % of glucose levels between 70-180 mg/dL) and %CV), and hemoglobin A1C level (A1C). Self-reported outcomes (diabetes self-care and psychological factors) were collected through validated questionnaires. Multiple regression analyses were performed to determine whether individual sleep dimension and MSH scores independently predicted glycemic control or self-reported outcomes.
Results: Median (IQR) age was 33.87 (27.4, 43.61) years, 69.49% were female, and mean (SD) A1C was 6.74% (.93). After adjusting for covariates, only less sleep regularity was associated with poorer glycemic control [higher %CV (β=.262, p<.01), less TIR (β=-.280, p<.01) and higher A1C (β=-.175, p<.05)]. Sleep satisfaction was associated with higher diabetes quality of life (β=-.243, p<.01), lower diabetes distress (β=-.189, p<.05), lower fatigue (β=-.249, p<.01), and lower depression (β=-.211, p<.05). Daytime sleepiness was associated with higher fatigue (β=.228, p<.05), while later sleep timing was associated with higher depressive symptoms (β=.211, p<.05). Higher sleep efficiency was associated with lower anxiety and depression (β=-.305, p<.01, β=-.293, p<.01), respectively. Sleep duration was not associated with any outcomes. Higher MSH was significantly associated with higher TIR (β=.191, p<.05), lower A1C level (β=-.266, p<.01), and lower depression (β=-.211, p<.05), Diabetes self-care measures were not predicted by any individual sleep dimensions or MSH score.

Conclusion: Individual sleep dimensions and MSH composite score are linked to glycemic and self-reported psychological outcomes, highlighting the importance of comprehensive sleep health evaluation in T1D.
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0887

EFFECTS OF MELATONIN ON GLUCOSE, INSULIN, AND C-PEPTIDE DYNAMICS IN CARRIERS OF MTNR1B TYPE 2 DIABETES RISK VARIANT

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Introduction: Genome-wide association studies identified the common variant rs10830963 in the MTNR1B gene (encoding melatonin receptor 1B) as a risk factor for type 2 diabetes. This sparked great interest in the role of the circadian hormone melatonin in glycemic control; however, the mechanisms underlying this association remain unclear. We investigated whether exogenous melatonin administration worsens glucose tolerance, insulin sensitivity, and beta-cell function, and whether such effect is stronger in MTNR1B G-allele risk carriers compared to non-carriers.
Methods: Twenty-one healthy participants of European ancestry were studied in a double-blind, randomized, cross-over trial, including ten MTNR1B risk carriers (mean age±SD, 29±10y; BMI, 24.4±2.6kg/m2; 5 women) and eleven non-carriers (32±10y; 22.5±3.0kg/m2; 3 women). Each participant underwent a highly-controlled 5-day laboratory protocol, during which they received 5mg oral melatonin or placebo in randomized order on two nonconsecutive days. Elevated circulating melatonin levels after melatonin administration were confirmed by hourly blood draw. Insulin sensitivity (SI), beta-cell function, and disposition index (DI, product of insulin secretion and sensitivity) were derived from insulin-modified frequently-sampled intravenous glucose tolerance test (FSIGT) using minimal models.
Results: The effect of melatonin versus placebo differed significantly between MTNR1B genotypes for glucose incremental area under the curve (iAUC180min, Pinteraction=0.005), insulin iAUC20min (Pinteraction=0.03), and C-peptide iAUC-20min (Pinteraction=0.03) during FSIGT, with 11.7% increase in glucose iAUC180min (95%CI 3.1%—20.2%, P=0.03), 25.2% decrease in insulin iAUC20min (4.4%—41.2%, P=0.06), and 19.2% decrease in C-peptide iAUC20min (4.9%—31.2%, P=0.04) in carriers, without significant changes in non-carriers (n.s.). While we did not find significant effects of melatonin nor its interaction effects with MTNR1B genotype on DI and SI, first-phase insulin secretion was affected differently by melatonin in carriers and non-carriers (Pinteraction=0.001), with a 40.0% reduction in carriers (27.6%—50.3%, P< 0.0001), but no significant changes in non-carriers (n.s.).
Conclusion: Exogenous melatonin administration significantly impaired glucose tolerance and beta-cell function in MTNR1B risk carriers, but not in non-carriers. These data suggest that first-phase insulin secretion plays an important role in mediating the effect of melatonin on glucose control and its interaction with MTNR1B genotype.
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0888

CHARACTERIZATION AND OUTCOMES IN PATIENTS WITH BRONCHIECTASIS AND OBSTRUCTIVE SLEEP APNEA WITH PAP THERAPY

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Introduction: Bronchiectasis (BE) is characterized by recurrent infections and dilated airways and has been associated with recurrent exacerbations and hospitalizations affecting quality of life. Approximately 40-60% of patients with BE have concomitant OSA, with an increased AHI (apnea-hypopnea index) in BE patients with Pseudomonas infections. We hypothesize that patients with BE are less tolerant of PAP therapies, contributing to worsening quality of life related to either condition. We aim to determine differences in PAP adherence and treatment response in patients with BE and OSA compared with a matched OSA-control group.
Methods: A retrospective cohort analysis was conducted on adult patients evaluated at Mayo Clinic Center for Sleep Medicine between January 2000 to December 2020. Inclusion criteria were patients greater than 18 years old diagnosed with BE and OSA per current guidelines and were prescribed PAP therapy. Control OSA patients were matched to BE/OSA patients by gender, BMI, and AHI severity. Exclusion criteria included cystic fibrosis, hospice enrollment, active lung transplant evaluation, and lack of sleep clinic follow-up. Follow-up visits determined PAP compliance and change in quality-of-life metrics over 3 years.
Results: We compared 50 patients with BE/OSA with 74 OSA matched controls. The etiology of BE in these cases included COPD (32%) or other etiologies (34%). Baseline characteristics were not statistically different in gender, BMI, and AHI severity across groups. Median treatment follow-up for the BE/OSA group was 3 years [IQR 2 to 4]. Importantly, there was no statistically significant difference in PAP adherence in patients with BE/OSA compared to OSA controls regardless of etiology of BE, but these patients more often required supplemental oxygen therapy. Interestingly, there was a statistically significant increase in MRC and decrease in FEV1 over time in BE patients compliant to therapy.
Conclusion: There was no significant difference in baseline OSA characteristics, treatment response, and PAP adherence, except for need of oxygen supplementation in BE patients with OSA compared with matched non-BE OSA controls. FEV1 values decreased, and dyspnea score increased in BE patients compliant to PAP therapy; however, future larger studies should include longer-term follow-up to further assess the impact of PAP therapy on BE progression and outcomes.
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0889

ASSOCIATION OF U.S. MILITARY BURN PIT SMOKE EXPOSURE WITH OBJECTIVE SLEEP PARAMETERS AMONG SMOKING VETERANS

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Introduction: Burn pits (BPs) have been widely used by the U.S. military for waste disposal. Due to the obviously toxic nature of the BP emissions exposure (BPe) may contribute to diverse adverse health conditions, including sleep apnea. This study aimed to examine the association between self-estimated amount of BPe and objective sleep problems among smoking veterans.
Methods: Using polysomnography reports in the Veteran Affairs electronic medical records, sleep measures were extracted for 4940 Veterans and active-duty personnel (age 39.7±9.2 y, BMI 29.3±4.6 kg/m2, 16% female, 66% white) registered on the VA/DoD Airborne Hazards and Open Burn Pit Registry. Objective sleep parameters included Total Sleep Time (TST) and Sleep Efficiency (SE). Cumulative BPe variable was calculated by multiplying the response (in hours) to a question about BPe by number of deployment days, summing across deployments, and categorized into quartiles by ranking. Inverse probability treatment weighing method was used to adjust the imbalances of covariates age, BMI, sex, race, ethnicity, military branch, and duty status between treatment groups. We employed separate weighted logistic regression models to determine the association between cumulative BPe days and sleep outcomes among smoking veterans.
Results: Current smokers in prolonged BPe quartile predicted higher odds of shorter TST (OR:1.43, 95%CI: 1.08-1.89, p=0.02, with reference to never smokers), whereas no significance shown in SE (OR:0.97, 95%CI: 0.75-1.27, p=0.89).
Conclusion: Higher levels of self-estimated BPe was associated with shorter objective TST in current smoking veterans. Smoking may exert synergistic effect to BP emission exposure on sleep problems. Further research is needed to define the effects of BP emission exposure on sleep among deployed and non-deployed Veterans.
Support (if any): This work is supported by the Department of Veteran Affairs, Veterans Health Administration, Office of Research and Development, and the Center for Innovations in Quality, Effectiveness and Safety (CIN 13-413), Michael E DeBakey Veteran Affairs Medical Center Bridge Grant, and the VA Airborne Hazards and Burn Pit Center of Excellence Pilot Grant.

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0890

POLYSOMNOGRAPHY EXTRACTED SLEEP HEALTH DISPARITIES AMONG BURN PIT REGISTERED U.S. MILITARY VETERANS

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Introduction: Disparities are under-recognized factors for sleep health. Additionally, there are concerns about sleep health among Veterans with exposure to burn pit emissions during deployment. This study aimed to examine the association between age, sex, and race and objective sleep related problems in veterans and active duty personnel.
Methods: Using polysomnography reports between April 2000 and September 2022 in the Veteran Affairs electronic medical records, objective sleep problems were extracted to 4940 Veterans and active duty personnel (age 39.7±9.2 y, BMI 29.3±4.6 kg/m2, 16% female, 66% white) registered on the VA/DoD Airborne Hazards and Open Burn Pit Registry. We examined the association between sociodemographic variables (age, sex, and race) and objective sleep related problems (Total Sleep Time (TST), Sleep Efficiency (SE), Minimum SAO2, and Apnea-Hypopnea Index (AHI)) in separate logistic regression models.
Results: Middle age Veterans (41 - 50 y) predicted greater odds of shorter TST, lower SE, (ORs:1.26-1.36, p's< 0.03), and older age Veterans (>50 y) predicted greater odds of shorter TST, lower SE, lower Minimum SAO2, and higher AHI (ORs:1.29-1.71, p's< 0.01). Male sex predicted greater odds of shorter TST, lower SE, lower Minimum SAO2, and higher AHI (ORs:1.22-1.97, p's< 0.04). African American race predicted greater odds of shorter TST (OR:1.25, p=0.04).
Conclusion: We observed a higher prevalence of objective sleep problems and sleep-disordered breathing problems among middle age compared to young Veterans and males compared to females. We also found a higher prevalence of shorter TST in Black compared to White Veterans and active duty personnel who completed the burn pit registry. This research address the importance of sleep health disparities of objective sleep related problems among Veterans with burn pit emission exposure.
Support (if any): This work is supported by the Department of Veteran Affairs, Veterans Health Administration, Office of Research and Development, Center for Innovations in Quality, Effectiveness and Safety (CIN 13-413); Michael E DeBakey VAMC Bridge Grant, and VA Airborne Hazards and Burn Pit Center of Excellence Pilot Grant (PI:Nowakowski).

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0891

SLEEP QUALITY AMONG POST-9/11 VETERANS WITH EXPOSURE TO AIRBORNE HAZARDS

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Introduction: Disordered sleep, including insomnia and obstructive sleep apnea, is common among post-9/11 veterans returning from Southwest Asia and Afghanistan. Environmental exposures, such as elevated respirable particulate matter, may contribute to the development of sleep apnea. Additional occupational exposures sustained during military service may contribute to poor sleep, for example hyperarousal and resultant insomnia. We sought to describe sleep quality and prevalence of sleep

disorders among a veteran population exposed to airborne hazards with unexplained dyspnea.
Methods: Veterans from across five sites of the Post-Deployment Cardiopulmonary Evaluation Network (PDCEN) completed, as part of a more comprehensive evaluation, questionnaires inclusive of demographic information and the Pittsburgh Sleep Quality Index (PSQI). Limited polysomnography data was also available through chart review at the Baltimore site. Descriptive statistical analysis was performed, with means and standard deviations or medians and interquartile ranges reported for all questionnaire and PSG outcomes, as appropriate.
Results: In total, 168 veterans completed the PSQI and demographic questionnaires. The majority of respondents were aged 45±9 years, male (82%), and white (73%). Approximately half had served in the Army branch of the military. BMI was available for only 127 veterans, with mean 31.9±5.9 kg/m2. The group overall reported prolonged sleep onset latency (56±51 minutes) and reduced total sleep time (5±1 hours). Overall PSQI scores were elevated at 13±5. In Baltimore (N=38), PSQI data was similar. Sleep study data was available for 30/38 veterans, of whom 27 had a diagnosis of obstructive sleep apnea (OSA). Among those with OSA, the median AHI was 13.5 (IQR 14.5) events/hour and the mean BMI was 31.0±5.2 kg/m2.
Conclusion: Among a cohort of post-9/11 veterans with exposure to airborne hazards, insufficient and disturbed sleep was common. In a limited subset with sleep study data, the majority had at least mild OSA. Future work will evaluate the presence of comorbid medical and mental health conditions. This early descriptive data is consistent with prior reports among similar veteran populations, and highlights the need for further research to elucidate causes of sleep disturbances and possible relation to exposure to airborne hazards.
Support (if any): Supported by the VA's Airborne Hazards and Burn Pits Center of Excellence

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0892

ROLES OF PAIN INTERFERENCE, PAIN INTENSITY, AND SLEEP-PARTNER IN INSOMNIA AND DAYTIME SLEEPINESS AMONG VETERANS

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Introduction: Insomnia and daytime sleepiness are prevalent in Veterans, many of whom have co-morbid pain. Although ample evidence suggests an association between sleep and pain, the differential roles of pain-related daytime dysfunction (hereafter, "pain interference") and pain intensity in insomnia and daytime sleepiness are less known. These associations may also be influenced by the presence of a sleep-partner, who has been shown to provide psychological comfort but may also interfere with the physical comfort of one's sleep environment. Thus, this study examined the unique associations of pain interference and pain intensity, as well as the moderating effects of sleep-partner, with symptoms of insomnia and daytime sleepiness among Veterans presenting to a sleep clinic.
Methods: Veterans presenting to the Miami VA sleep clinic for sleep apnea assessment (N=405, M age=50.3 years, 84.3% male) completed the PROMIS-29 (pain interference, pain intensity), Insomnia Severity Index, and Epworth Sleepiness Scale, and reported whether they sleep with a partner or not. Structural equation modeling was used to examine the study aims while controlling for age, gender, and apnea-hypopnea index.
Results: On average, Veterans reported moderate levels of pain interference, pain intensity, and insomnia severity, as well as mild levels of daytime sleepiness. Over half (59.0%) of the Veterans endorsed sleeping with a partner. Among Veterans who slept without a partner, greater pain intensity was associated with greater insomnia severity (b=.14, p=.002). Among Veterans who have a sleep-partner, greater pain intensity was associated with both greater insomnia severity (b=.09, p=.017) and greater daytime sleepiness (b=.53, p=.038). Pain interference was not associated with insomnia or daytime sleepiness in either group (b<=.02, p>=.084).
Conclusion: Findings indicated the unique and deleterious role of pain intensity in insomnia and daytime sleepiness in Veterans, particularly among those who sleep with a partner. Such evidence highlights the interdependent nature of sleep and suggests considerations of dyad-level factors in sleep interventions. Further investigations are warranted to elucidate the biopsychosocial factors underlying the current findings.
Support (if any):

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0893

IMPACT OF POSITIVE AIRWAY PRESSURE THERAPY ON CLINICAL OUTCOMES IN OLDER VETERANS WITH COMORBID CHRONIC OBSTRUCTIVE

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Introduction: Cognitive impairment in older Veterans is an independent predictor of subsequent mortality and disability. Pilot data indicate that patients with OSA-COPD Overlap Syndrome (OVS) have reduced sleep quality and quality of life (QoL). However, there are no prior systematic studies evaluating treatment paradigms in patients with OVS. Our ongoing clinical trial is investigating whether, compared with usual care, positive airway pressure (PAP) therapy alleviates sleep disturbances, sleepiness, and improves cognitive function and QoL in older adults with OVS.
Methods: The design is a prospective parallel group randomized controlled trial in Veterans 60 years and older, with moderate-to-severe OSA with concomitant COPD (OVS). 225 eligible participants will be randomized to two treatment groups (PAP and conservative care) in 2:1 ratio for a duration of 6 months. Participants on the conservative care arm are required to follow good sleep habits and sleep hygiene, and on the PAP arm, in addition, are required to be adherent to PAP treatment (CPAP or Bilevel PAP, as required). Sleep questionnaires are administered to evaluate sleepiness, sleep quality, and general and disease specific QoL. Cognitive function is evaluated using Trail Making Test Part A and B, Paced Auditory Serial Addition Test, Stroop Task, Digit Coding, Hopkins Verbal Learning Test-R, Weschler Abbreviated Scale Intelligence II, Weschler Memory Scale IV, and Psychomotor Vigilance Test, respectively. All tests are administered at baseline visit, 3 months, and 6 months.

Results: We have enrolled 222 participants between Detroit and Ann Arbor VAMC locations, randomized 50 participants (48 males, 5 females; age: 70.5±6.5 years, BMI: 29.2±6.3kg/m2, AHI: 44.4±20.9events/hr, spirometry FEV1: 61.6±14.9% predicted, arterial blood gas (n=37) PaCO2:41.3±3.7 mmHg, ESS: 7.6±4.3, Six Minute Walk Test Total Distance Walked: 389.6±105.7 meters, FOSQ Total Score: 17.0±3.5, SGRQ Total Score: 45.6±22.6;30 participants have completed the study per the protocol. Group analysis will be available at the end of the trial. COVID pandemic has negatively impacted enrollment targets.
Conclusion: Final results from our study will determine the effects of treating a novel target (OVS) to maximize daytime function and QoL, while also providing a framework for early treatment of mild cognitive impairment in vulnerable older Veterans.
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0894

EFFECTS OF CHRONIC RHINOSINUSITIS (CRS) ON SLEEP DURATION AND VARIABILITY IN WORLD TRADE CENTER (WTC) RESPONDERS

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Introduction: 43.5% of World Trade Center rescue and recovery workers demonstrate symptoms of chronic rhinosinusitis (CRS). Subjects with CRS report increased sleep complaints and shorter subjective sleep duration compared to those without CRS. Discomfort from nasal symptoms during sleep may result in shorter sleep duration and an increased night-to-night variability. We compare actigraphic assessment of sleep duration and variability in subjects with and without CRS.
Methods: WTC-responders in an on-going study assessing sleep apnea and Alzheimer's disease biomarkers underwent 2-week actigraphy with sleep diary before in-lab polysomnography. Demographics, CRS symptoms, Insomnia Severity Index (ISI), Epworth Sleepiness Scale (ESS), sleep duration and complaint information were obtained. CRS+ was defined as ≥3 symptoms: facial pain, post-nasal drip, nasal congestion, blocked nose, loss of smell, sneezing, sore throat or hoarseness. Nightly actigraphy data were analyzed using Cole-Kripke algorithm and averaged over all nights to obtain mean total sleep time (TST) and coefficient of variability (CV) across nights. Group comparisons were performed using two-sample t-test with significance level at $p < 0.05$.
Results: 42 subjects (74%M/26%F, age 64.7±5, BMI 28.6±6kg/m2) had 14 nights (range=11-17) of actigraphy data. Subjective sleep duration and TST by actigraphy were correlated (r=0.4, p=0.02). 19(45%) were CRS+ vs 23(55%) CRS-. Age, sex, BMI, and sleep apnea prevalence did not differ between CRS+ vs CRS- groups. Mean (SD) ISI in CRS+=8.4(5.4), CRS-=5.4(5.4), p=0.08. ESS in CRS+=4.2(2.5), CRS- =4.6(3.0), p=0.6. Although not statistically significant, mean subjective sleep duration in hours was shorter and more variable in CRS+=7.84(1.3) than CRS- =8.34(0.7), p=0.1. Actigraphic sleep duration (TST) in hours was shorter and more variable in CRS+ [6.59(1.2), CV=22.7(9.5)] than CRS- [6.80(0.8), CV=20.7(7.2)].
Conclusion: WTC-responders with CRS symptoms report shorter subjective sleep and greater insomnia similar to our previous findings. While we did not demonstrate a significant difference in actigraphic sleep duration or variability between CRS groups, we were limited by a small sample size. The high prevalence of CRS and sleep complaints in this population and the association of reduced sleep duration and increased morbidity and mortality highlights the importance of establishing if there is a shorter sleep duration in CRS+ patients through further investigation.
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0895

GREATER SLEEP REACTIVITY AND POORER SLEEP EFFICIENCY ARE ASSOCIATED WITH INCREASED MEDICAL EXPENDITURES

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Introduction: Insufficient sleep costs the U.S. economy over $411 billion per year in lost productivity. However, most studies investigating the economic costs of sleep rely on flawed retrospective measures of sleep (e.g., typical sleep patterns in the past month). These measures are prone to recall bias and do not accurately capture daily variability in sleep patterns. To address these gaps, we examined how sleep metrics captured from prospective sleep diaries were associated with medical claims approximately one year later.
Methods: Participants were 452 World Trade Center 9/11 responders enrolled in the World Trade Center Health Program in 2017 (mean age = 52.22 years, SD = 8.73, 10.6% female). At baseline, participants completed 14 days of self-reported sleep and stress measures each morning. Mean sleep efficiency, variability in sleep efficiency, as well as a novel measure of sleep reactivity (i.e., how much people's sleep efficiency changes in response to previous-day stressors) were used to predict total yearly medical claims, physical health claims, and mental health claims approximately one year later , covarying for participant age and sex.
Results: Greater sleep reactivity to stress was associated with more total medical claims ($b = \$7{,}742.63$, $p < .001$), more physical health claims ($b = \$1{,}421.87$, $p < .001$), and more mental health claims ($b = \$2{,}682.81$, $p < .001$). Lower mean sleep efficiency was associated with more total medical claims ($b = -\$7{,}669.63$, $p = .018$), more physical health claims ($b = -\$2{,}103.42$, $p = .026$), and more mental health claims ($b = -\$2{,}494.76$, $p = .011$). Greater variability in sleep efficiency was associated with more total medical claims ($b = \$14{,}020.82$, $p = .010$) and more mental health claims ($b = \$7{,}035.91$, $p < .001$).
Conclusion: Individuals with greater sleep disturbances engage in more healthcare utilization. Given the steep costs of insufficient

sleep, it may be important to proactively address sleep problems to prevent downstream social and economic consequences.
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0896

YEARS OF LIFE LOST DUE TO INSUFFICIENT SLEEP AND ASSOCIATED ECONOMIC BURDEN IN CHINA FROM 2010 TO 2018

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Introduction: Research on the health and economic costs due to insufficient sleep remains scant in developing countries. This study aims to estimate the years of life lost (YLLs) due to short sleep and quantify its economic burden in China.
Methods: This study estimated both individual and aggregate YLLs due to short sleep (i.e., ≤ 6 h) among Chinese adults aged 20 years or older by sex and 5-year age groups from 2010 to 2018. Life expectancy estimates were derived from nationally representative prevalence data, relative mortality risks from meta-analyses, and life tables in China.
Results: Younger age groups and males had more YLLs due to short sleep compared to their counterparts. The individual YLLs were 0·98, 0·95, 0·94 for men, and 0·78, 0·74, 0·73 for women aged 20-24 in 2010, 2014, and 2018, respectively. Patterns of individual YLLs were largely stable across the years. In aggregate, China experienced a rise from 66·75 million YLLs in 2010 to 95·29 million YLLs in 2014, and to 115·05 million YLLs in 2018. Compared to 2010 ($191·83 billion USD), the associated economic cost in 2014 increased to $ 422·24 billion USD, and the cost in 2018 more than tripled ($628·15 billion USD). The percentage of cost to Chinese GDP in corresponding years was 3·23%, 4·09%, and 4·62%.
Conclusion: Insufficient sleep is associated with reduced life expectancy in China. The escalating economic toll attributed to short sleep underscores the urgent need for public health interventions to improve sleep health at the population level.
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0897

THE RELATIONSHIP BETWEEN MARITAL SATISFACTION AND SLEEP

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Introduction: Relationship quality impacts health outcomes. Individuals with high marital satisfaction report having better health than those with low marital satisfaction (MS). How marital satisfaction may impact sleep health is unclear. We examined if MS is associated with subjective sleep quality and sleep duration among working adults.
Methods: The Worksite Blood Pressure Study is a multi-site study investigating psychological factors and ambulatory blood pressure. The study recruited 472 participants without major cardiovascular disease from 10 New York City worksites during 4 waves over 11 years. At Wave 4, participants completed the Dyadic Adjustment Scale (DAS), which assesses MS, and a sleep questionnaire derived from the Sleep Heart Health Study. Weekday sleep duration was reported using a one-time sleep diary. For this analysis, 20 items from the DAS were summed to create a sum score with higher scores indicating greater MS. Items assessing sleep quality were averaged (higher scores indicated worse sleep quality). The current analysis was restricted to 188 married participants at Wave 4 with complete data. Linear regression models were specified predicting (1) sleep quality and, separately (2) sleep duration from marital satisfaction. Covariates were age, sex, race/ethnicity, family income, and number of children in the home.
Results: Of the 188 participants, 91.0% were male, 7.5% were Black, and 4.8% were Hispanic/Latinx. Participants reported a median of 2 children living in the home and a median family income of $80,000-$89,999. Mean age was 53.0 years (SD = 8.0 years), mean marital satisfaction was 60.5 (SD = 13.2), mean sleep quality was 8.1 (SD = 4.2), and mean sleep duration was 6.5 hours/night (SD = 1.1 hours). Greater MS was significantly associated with better sleep quality (B = -0.09, 95% CI -0.13, -0.04, $p < 0.001$) but not with sleep duration (B = -0.00, 95% CI -0.02, 0.01, $p = 0.47$).
Conclusion: Greater MS was associated with better sleep quality; however, MS was not associated with sleep duration. Whether targeted interventions focusing on improving MS lead to improvements in sleep quality and/or sleep health is an area of active research.
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0898

SOCIAL VULNERABILITY AND SLEEP HEALTH IN YOUNG ADULTS WITH TYPE 1 DIABETES

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Introduction: Young adults aged 18 to 26 years with type 1 diabetes (T1D) are at high risk for social vulnerability and poor sleep health (sleep disturbance and shorter sleep duration) due to social, economic, and geographic shifts. However, the role of social vulnerability in the sleep health of young adults with T1D is not well understood. The purpose of this quantitative descriptive study was to examine the association between indicators of individual- and neighborhood- level social vulnerability and sleep health among young adults with T1D.
Methods: The Centers for Disease Control/Agency for Toxic Substances and Disease Registry Social Vulnerability Index was used to measure neighborhood-level social vulnerability (socioeconomic status, housing type/characteristics, racial and ethnic minority status, and transportation). Individual-level social vulnerability was measured with a 7-item composite based on the National Patient Social Determinants of Health Risk Assessment Protocol for Responding to and Assessing Patient Assets, Risks, and Experiences (race, ethnicity, education, language, income, employment, and stress). Sleep disturbance was measured with the 4-item Patient-Reported Outcomes Measurement Information System was used to measure sleep disturbance and research grade actigraphy over 14 days.
Results: Forty-four young adults with T1D (38.6% female, mean age 20.9 years, mean A1C 8.6%) completed the baseline measures

of a 12-week interventional study. Higher individual level social vulnerability was associated with higher sleep disturbance in the unadjusted and adjusted models (B = .414, p < .001, R2 = .171; B = .446, p = .010, R2 = .218). Higher neighborhood level social vulnerability was associated with shorter actigraphy-derived sleep duration in the unadjusted models (B = -.326, p = .043, R2 = .106); however, the association was no longer significant in the adjusted models (p = .068). Models were adjusted for sex, T1D duration, and BMI. The associations between individual level social vulnerability and sleep duration or neighborhood level social vulnerability and sleep disturbances were not significant.
Conclusion: More research is warranted to better understand the intricate relationship and role of multiple individual and neighborhood-level social drivers in the sleep health of young adults with T1D.
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0899

BIDIRECTIONAL LINKS OF DAILY SLEEP QUALITY AND DURATION WITH PAIN IN VETERANS WITH ALCOHOL USE DISORDER

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Introduction: Military Veterans tend to experience chronic pain and sleep problems of higher intensity and prevalence than the general population, and may be more likely to self-medicate with substances such as alcohol. Research suggests that sleep and pain are interrelated. However, few studies have examined bidirectional links between daily sleep quality and duration with pain among Veterans, especially those with alcohol use disorders. Furthermore, it has not been studied whether daily alcohol consumption (whether they drank or not) moderates everyday associations between sleep and pain among Veterans with alcohol use disorders.
Methods: 114 Veterans with alcohol use disorder (82.5% men: mean age = 38.86 [range 21–67]) completed 14 days of diaries assessing their sleep quality, sleep duration, pain, and drinking quantity. Multilevel modeling examined the effects of daily variability in sleep (within-person effects) and average levels of sleep (between-person effects) on pain the following day. To examine the effects of pain on sleep, multilevel modeling examined the effects of daily variability in pain and average levels of pain on sleep.
Results: Regarding bidirectional links of sleep quality and pain, greater daily (b=−.86, se=.41, p=.04) and average (b=−15.51, se=3.28, p<.001) sleep quality were associated with lower next-day pain. Higher average pain was associated with poorer sleep quality (b=−.01, se=.002, p< .001), but daily pain was not associated with daily sleep quality. Regarding bidirectional links of sleep duration and pain, there was no daily association between sleep duration and pain, but greater average sleep duration was associated with lower pain levels (b=−4.84, se=1.60, p=.003). Daily drinking did not moderate these associations.
Conclusion: Both sleep quality and sleep duration are closely associated with pain among Veterans with alcohol use disorder. Fluctuations of daily sleep quality affected Veterans' pain experience in everyday life regardless of alcohol consumption; in contrast, fluctuation of daily pain did not affect daily sleep quality, implying that Veterans with alcohol use disorder are sensitive to poor sleep quality. The results support that sleep quality may buffer daily pain experiences among this patient population.
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0900

COMPARING A LIFESTYLE PLUS SLEEP EXTENSION TO A LIFESTYLE INTERVENTION IN ADULTS WITH SHORT SLEEP AND PREDIABETES

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Introduction: The purpose of this study was to evaluate the extent to which a sleep extension intervention optimized the well-established effects of a diet and physical activity lifestyle intervention on improved metabolic outcomes in adults with prediabetes (hemoglobin A1c ≥5.7% and ≤6.4%) and short sleep duration (≤6.5 hours/night actigraphy-estimated sleep).
Methods: 157 eligible adults (mean age=52.16 years, 69% female, 66% White, 36% Black, 11% Asian, 7% other race) were randomized to an 8-week lifestyle plus sleep extension (n=88) versus lifestyle control (n=69) condition. Participants completed pre and post assessments of device-estimated glucose, sleep, and waist circumference. Self-reported sleep quality and daytime sleepiness were also assessed. Paired sample t-tests modeled pre to post-intervention changes in these measures.
Results: Device-estimated sleep duration increased significantly in both conditions [intervention condition 17.04 (SD=42.98) minutes; control condition 24.18 (SD=38.10) minutes]. Sleep onset time, sleep midpoint, and weekend sleep midpoint advanced in the intervention condition only [-16.71 (SD=52.48) minutes, -9.40 (SD=38.82) minutes, -20.83 (SD=54.30) minutes, respectively]. Sleep quality improved clinically and significantly in the intervention condition; mean Pittsburg Sleep Quality Index score decreased from 8.32 (SD=2.82) to 4.77 (SD=2.55). Sleep quality improved significantly in the control condition from 7.75 (SD=2.97) to 6.35 (SD=2.88). Between group differences in sleep quality change scores showed greater improvement in intervention versus control participants (p< 0.001). Daytime sleepiness decreased significantly in both conditions (-3.15 intervention versus -1.18 control). Between group differences in daytime sleepiness showed greater improvement in intervention versus control participants (p< 0.001). On average, waist circumference decreased by -0.74 (SD=5.19) cm. in the intervention and -1.56 (SD=5.21) cm. in the control condition; these changes scores did not differ significantly between conditions. There were no statistically significant improvements in devise-estimated glucose measures.
Conclusion: Adding sleep extension to a lifestyle change intervention improved several dimensions of sleep, beyond sleep duration, that have been associated with poor metabolic health (e.g. sleep times, sleep quality). The two conditions did not differentiate in terms of increasing sleep duration or decreasing waist circumference suggesting that individuals should at least have lifestyle interventions as a component of care. Neither condition improved glycemic outcomes.
Support (if any): NIH (R00NR017416)

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0901

EFFECTS OF A PHYSICAL ACTIVITY INTERVENTION ON SLEEP AMONG CANCER SURVIVORS IN THE CANCER PREVENTION STUDY-3

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Introduction: Disruptions to sleep have been reported in many cancer survivors, with lasting impacts reported several years after treatment. Physical activity (PA) has been shown to improve sleep outcomes. We evaluated the effects on self-reported and device measured sleep outcomes within a PA intervention among cancer survivors.
Methods: The Health and Energy through Active Living Every Day (HEALED) intervention was a randomized controlled trial of 415 cancer survivors identified from the American Cancer Society (ACS) Cancer Prevention Study-3 (CPS-3) cohort enrolled in a year-long, web-based, PA intervention to increase social support, improve exercise self-efficacy, and facilitate self-monitoring of PA. Participants were randomized 2:1 to an interactive PA website (intervention) or a static balance and flexibility website (controls). Sleep was assessed through PROMIS 6-item Sleep Disturbance Scale and SATED sleep questionnaire. In addition, participants were provided a Fitbit Charge 5 to self-monitor PA and sleep. We conducted an intent-to-treat analysis and calculated t-tests to evaluate change in sleep outcomes between the two groups at the end of the 1-year study period.
Results: A total of 351 participants completed the year-long intervention. Most participants were White (93%), female (94%), had a history of breast cancer (73%), were on average 62 years old (sd=8) and 6 years (sd=2) post-diagnosis. At baseline, both control (5 (metabolic equivalent task) MET-hours/day) and intervention (4.9 MET-hours/day) self-reported similar levels of moderate to vigorous physical activity (MVPA). Both groups reported good sleep quality at baseline with a SATED score of 8.0 (sd=1.8) and PROMIS of 48 (sd=7.5) in controls and 7.8 (sd=1.8) and 49 (sd=7.6), respectively, in intervention. The intervention group reported higher MVPA after 1 year (6.7 MET-hours/day vs 5.4 MET-hours/day, p=0.01). There were no statistically significant changes in self-reported sleep quality.
Conclusion: Long-term cancer survivors, with relatively healthy sleep quality at baseline, randomized to a PA intervention did report increased MVPA after a year, but this had little impact on sleep. Results with device-based MVPA and sleep measures are forthcoming.
Support (if any): The American Cancer Society funds the creation, maintenance, and updating of the Cancer Prevention Study-3 cohort. This analysis was also supported through an unrestricted research grant from Sleep Number Corporation.

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0902

INCREASED SLEEP DISRUPTION IN PATIENTS WITH ADVANCED CANCER UNDERGOING IMMUNOTHERAPY

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Introduction: Sleep disruption is common in patients with advanced cancer. In addition to cancer-related factors, therapies such as chemotherapy, hormonal therapy and radiation may contribute to poor sleep. The role of immunotherapy in sleep disturbance is not well-studied; however, sparse evidence suggests that better sleep quality may improve clinical outcomes and reduce immunotherapy-related toxicity. We conducted a study to evaluate self-reported sleep in patients with advanced cancer receiving immunotherapy to better characterize their sleep quality.
Methods: We reviewed 250 patients sequentially undergoing immunotherapy in a single tertiary cancer center for advanced cancer from February 2020 to February 2022. The Pittsburgh Sleep Quality Index (PSQI) was used to quantify self-reported sleep quality. Individual components were assessed to gain a holistic picture of the patients' perceptions of their sleep.
Results: The global PSQI score was greater than 5 in 75 of 250 patients (30%), signifying overall poor sleep. Mean global PSQI score was 6.97 with a standard deviation of 3.87 and a standard error of 0.24. Analysis of the other components of the PSQI revealed mild impairment of sleep efficiency, increased daytime sleepiness and decreased motivation. The mean score for sleep aid use was 0.94, indicating sleep aid use less than once a week. Notably, the mean score of self-reported sleep perception was 0.791 with a standard deviation of 0.716, indicating overall satisfaction with sleep quality.
Conclusion: To our knowledge, this is the largest series to characterize self-reported sleep disruption in patients with advanced cancer receiving immunotherapy. Our results show that there is significant sleep aid use and sleep disruption in up to 30% of patients receiving immunotherapy. There was notable discordance between self-reported perception of sleep and the global PSQI score. This may be due to lower expectations for quality sleep on the part of the patients, given cancer burden and other comorbidities. If so, routine sleep assessment and specialist evaluation is imperative to improve quality of life and assure these patients that a better quality of sleep is possible. Further studies are indicated to characterize sleep architecture in these patients and assess correlation with clinical outcomes such as tumor response and adverse event rates.
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0903

PHYSICAL HEALTH CORRELATES OF SUBJECTIVE AND OBJECTIVE SLEEP MARKERS IN PATIENTS WITH CANCER AND THEIR CAREGIVERS

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Introduction: Sleep disturbance is frequently identified in patients with cancer and their caregivers, with detrimental impact on physical health. Less known is the extent to which self-reported and actigraphy-derived sleep patterns correlate between patients and their sleep-partner caregivers, and how the two modes of sleep measurements are related to physical health. Also unknown is the degree to which different operationalizations of actigraphy-derived sleep markers associate with physical health.

Methods: Patients diagnosed with colorectal cancer and their sleep-partner caregivers (81 dyads: on average 54 years old, 28% female patients, 60% Hispanic) completed sleep diaries daily and wore actigraphy continuously for 14 consecutive days, from which sleep duration and sleep onset latency (SOL) were calculated. Actigraphy-derived sleep markers were adjusted using sleep diary responses in two ways: One used the period participants intended to sleep (sleep intention method), and the other used the total period spent in bed (total bedtime method). Physical health was assessed via self-report and seven consecutive days of saliva collection, from which cortisol slope was quantified.
Results: Patients and their sleep-partner caregivers reported similar sleep patterns. Sleep duration, but not SOL had moderate level of agreement between self-report and actigraphy. Under the sleep intention method, caregivers' longer SOL and longer self-reported than actigraphy-derived sleep duration and SOL were related to poorer self-reported physical health ($|B| \geq 0.001$, $p < .043$); none of the associations were significant among patients. On the other hand, under the total bedtime method, patients' longer self-reported than actigraphy-derived SOL were related to poorer self-reported physical health ($B = -0.119$, $p = .024$); and none of the associations were significant among caregivers.
Conclusion: Findings suggest the employment of multimodal sleep and physical health assessments and operationalizations to precisely understand the characteristics and associations of sleep among patients with cancer and their sleep-partner caregivers. Psychobehavioral sleep interventions may consider paying attention to the differential impact of non-sleep activities in bed on patients' health. Investigation with other sleep indices (wake after sleep onset and sleep-wake rhythms), self-reported and biological health outcomes, and of the dyadic associations of the study variables between patients and their caregivers is warranted.
Support (if any):

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0904

THE PREVALENCE OF INSOMNIA AND FATIGUE IN CANCER PATIENTS PRE-POST RADIATION TREATMENT

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Introduction: Insomnia and Cancer-related fatigue (CRF) are highly prevalent during acute illness and survivorship, with almost 100% of cancer patients experiencing at least one of these at some point during treatment. Concerningly, insomnia and CRF have long-term effects on quality of life, daytime function, and are associated with medical and psychiatric morbidity. No studies to date have assessed concurrent change in CRF and insomnia with radiation therapy. Thus, the present analysis aimed to characterize insomnia & CRF prevalence and severity pre- and post-radiation.
Methods: Insomnia and fatigue were assessed pre- and post-radiation among 32 adults diagnosed with cancer (Mage=58.22 years, SDage=10.54, 46.9% female, 62.5% White). Subjects were asked to complete the Insomnia Severity Index, Functional Assessment of Chronic Illness Therapy – Fatigue Scale (FACIT-F), Brief Fatigue Inventory (BFI) and PROMIS-SF Fatigue 7A at each timepoint. Descriptive statistics are used characterize the severity of insomnia and CRF at each timepoint and exploratory t-tests examined whether sex was associated with change in insomnia and fatigue severity from pre- to post-radiation.
Results: The mean ISI total score was 8.25 (SD=5.01) pre-radiation, and 8.50 (SD=3.46) post-radiation. The mean FACIT-F total score was 40.34 (SD=9.01) pre-radiation and 34.67 (SD=8.69) post-radiation. There was one (3.12%) case of new-onset clinical insomnia and five (15.63%) cases of new-onset clinical fatigue from pre- to post-radiation. Females reported greater increases in fatigue from pre- to post-radiation compared to males ($t(31) = -4.612$, $p < 0.001$, $d = -1.44$).
Conclusion: Insomnia and fatigue are highly prevalent in patients diagnosed with cancer at both pre- and post-radiation. Overall, insomnia stayed relatively stable while fatigue increased over treatment. This suggests that separate mechanisms may drive cancer-related fatigue and insomnia. Fatigue increased over treatment for both men and women, however this effect was stronger for women. A better understanding of mechanisms of insomnia and CRF may allow for earlier detection of insomnia and CRF as well as the use of targeted interventions for individuals struggling with CRF and/or insomnia during cancer treatment and recovery, especially among women.
Support (if any): University of Pennsylvania, Radiation Oncology, Chair's Summer Research Grant

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0905

EFFECTS OF BENIGN PROSTATIC HYPERPLASIA SURGERY ON POSITIVE AIRWAY PRESSURE THERAPY COMPLIANCE IN SLEEP APNEA

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Introduction: Despite the high efficacy of continuous positive airway pressure (CPAP) to reverse the upper airway obstruction in obstructive sleep apnea (OSA), one of the greatest barriers to treatment is CPAP nonadherence. Benign prostatic hyperplasia (BPH) is a common diagnosis among the ageing male population that causes lower urinary tract symptoms (LUTS). Nocturia results in nighttime awakenings which may interfere with CPAP adherence. There are a variety of surgical interventions for the BPH. The aim of this study is to assess CPAP adherence rates before and after surgical intervention for treatment of BPH.
Methods: A within-subject retrospective analysis was performed at a single institution. Thus far, a sample size of 33 patients were analyzed and 16 met inclusion criteria. The target cohort included male patients who have a diagnosis of OSA and underwent surgical intervention for BPH between October 2013 and October 2023. The subjects included were also started on positive airway pressure (PAP) therapy before surgery. CPAP adherence measures were obtained one to six months prior to surgical intervention and compared to CPAP adherence measures six months post-surgical intervention. The change in PAP compliance from before surgical intervention to six months after surgery will be calculated and compared to a null value of zero (ie, no change) using a paired t-test.
Results: The average age of patients was 69.3. BPH procedures included were transurethral resection of the prostate (TURP) (37.5%), laser TURP (25%), holmium enucleation

(6.25%), prostatic implantation (31.25%). When comparing pre-procedural (92.4%) CPAP usage days (%) versus post-procedural (89.8%), there were no significant differences (p=0.6425). Similarly, pre-procedural (374.6) CPAP average usage (minutes) versus post-procedural (409.4) did not show a statistically significant difference (p=0.1153).
Conclusion: Our early findings are consistent with previous research indicating that the presence of BPH had no significant effect on CPAP adherence. Our study reviewed post-procedural effects on CPAP adherence. Surgical intervention for benign prostatic hyperplasia did not affect adherence with CPAP in OSA.
Support (if any): None

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0906

FREE-TEXT DOCUMENTATION OF SLEEP DISTURBANCE IN ACUTE MYELOID LEUKEMIA: A NATURAL LANGUAGE PROCESSING STUDY

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Introduction: Sleep disturbance in acute myeloid leukemia (AML) patients is usually linked to cancer-related fatigue, affecting quality of life. Although addressing sleep disturbance might prevent fatigue, it is often overlooked. Limited knowledge about healthcare clinician's observations of sleep disturbance in AML patients hampers evidence-based interventions. To address this gap, this study identified sleep disturbance documentation in patients with AML from free-text narrative notes in electronic health record (EHR) using a natural language processing (NLP).
Methods: The sample consisted of 692 patients with AML, who received 2,064 encounters at Midwestern academic hospital. We followed a stepwise process using NLP. 1) Identify a preliminary list of synonyms based on (a) 57 common symptoms from a previous study; (b) relevant literature; and (c) "synonyms" category of the Unified Medical Language System. We developed and validated algorithms using the publicly available NLP system, NimbleMiner, then an NLP algorithm was applied to extract sleep disturbance documentation using 316,038 EHR narrative notes of AML patients. The overall accuracy to identify documentation of sleep disturbance was high, with F score = 0.97.
Results: In general, this study involves older AML patients (average age, 59 years) and male (57%). When applying the NLP algorithm, 543/692 (78.5%) patients and 1,255/2,064 (60.8%) encounters in this sample were identified as having notes with language describing sleep disturbance. The most common language describing sleep disturbance was sleeping medication (40.5%), such as melatonin, olanzapine, zolpidem. Additionally, around 30% of languages mentioned sleep disorders including insomnia and obstructive sleep apnea (OSA).
Conclusion: We have demonstrated the feasibility of identifying sleep disturbance from EHR narrative notes with NLP in AML patients. While using sleeping pills are found as a common treatment option for sleep disturbance, it is important to consider the established first-line treatment for insomnia (cognitive behavioral therapy) and OSA (continuous positive airway pressure). Utilizing NLP-generated symptom indicators can assist in identifying high-risk patients for targeted sleep interventions. The impact of sleep disturbance on health outcome in AML patients should be further evaluated.
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0907

SLEEP DISTURBANCES IN LUNG CANCER PATIENTS BASED ON PATIENT REPORTED OUTCOMES AND POLYSOMNOGRAPHY

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Introduction: Sleep disturbances are common in lung cancer patients, but comprehensive evaluations with patient-reported outcomes (PRO) and sleep evaluation with polysomnography (PSG) is lacking. Earlier studies described significant insomnia in this cohort. This study describes sleep disruption using PROs and PSG to identify underlying sleep disorders.
Methods: A retrospective review of lung cancer patients undergoing formal sleep evaluation from 4/1/2009 to 7/31/2014 was performed. Clinical characteristics, PROs using Pittsburgh Sleep Quality Index (PSQI) and Epworth Sleepiness Scale (ESS), and PSG data were reviewed.
Results: 128 patients (58% men, median age 63 years, median BMI 29.9 kg/m2) were identified. Lung cancer stage was 40% early, 22% locally advanced and 38% metastatic disease, and most (48%) were undergoing active treatment. Comorbidities included hypertension (60%), COPD (42%), depression (16%) and anxiety (13%), and 59% were ever smokers. The majority (94%) were referred for sleep-related breathing disorder (SRBD). While 50% did not know when sleep disruption started in relation to their cancer, 33% report symptoms prior to cancer diagnosis, and 14% associate sleep disturbance after cancer diagnosis. Sleep aid use was reported by 26%, and pain medication use in 41%. In the 116 with ESS, daytime sleepiness was noted 56%. In the 101 with PSQI, 65% reported poor sleep. PSG was performed in 52%. Daytime sleepiness was inversely correlated with anxiety (OR 0.3, 95% CI 0.8 to 0.84). Poor sleep was associated with anxiety and COPD, but it was not significant. PROs did not have an impact on overall survival.
Conclusion: Sleep disturbances can contribute to symptom burden in lung cancer patients. Daytime sleepiness and poor sleep based on PROs was prevalent in our cohort. Although not significant, anxiety and COPD were associated with poor sleep, whereas daytime sleepiness was inversely associated with anxiety. Most of our patients had sleep-related breathing disorder while only a few had insomnia. Education about sleep health and proactive screening for sleep symptoms would be beneficial in lung cancer patients.

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0908

PAIN IN OSA PATIENTS IS MODULATED BY CHRONIC PAIN HISTORY AND SEX

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Introduction: Altered pain perception was found in OSA. However, the relationship remains unclear, possibly due to differential effects on pain of apnea-related sleep disturbance and hypoxemia, or other factors. This study examines the relationship between retrospective pain reports and PSG variables, sex, age, BMI, depression and insomnia questionnaires in patients referred for OSA evaluation.
Methods: From all in-lab patients between 08/2017 and 04/2021, 420 (259 women) were selected without significant cardiac, pulmonary, neurological, endocrine or psychiatric conditions; 136 had chronic pain conditions (CPC, e.g., fibromyalgia, arthritis, sciatica, musculoskeletal pain and similar). Patients filled out the Center for Epidemiologic Studies Depression Scale-Revised (CESDR), Insomnia Severity Index (ISI), Epworth Sleepiness Scale (ESS), Chronic Pain Grade Scale measuring pain intensity (CPGS-PI) and functional disability (CPGS-FD) in the preceding 6 months. CPGS-PI and CPGS-FD were outcomes in hierarchical backward regression models. Blocks of explanatory variables were: (1) age, sex, BMI; (2) AHI, SpO2-nadir, time below SpO2-90%, respiratory-related arousal index, (3) total sleep time, sleep latency, sleep efficiency, #awakenings, (4) CESDR, ISI, ESS, (5) OSA(AHI≥5), CPC presence, and sex-OSA-CPC interactions.
Results: Higher CPGS-PI was unrelated to the presence of OSA (AHI≥5, n=248), but was predicted by higher BMI (p=0.008), higher CESD (p< 0.001), higher ISI (p=0.006), CPC presence (p< 0.001), and CPC-by-sex interaction (p=0.005). Higher CPGS-FD was unrelated to OSA, but was predicted by higher BMI (p< 0.001), higher CESD (p< 0.001), higher ISI (p< 0.011), CPC presence (p< 0.001), and interactions CPC-by-OSA (p=0.017), CPC-by-OSA-by-sex (p=0.002). Analyzing the interaction terms, in the absence of CPCs OSA was unrelated to CPGS-FD, although women reported higher CPGS-FD (M=2.5±3.1) than men (M=1.4±2.3). Among patients with CPC, OSA had a differential effect on pain: women with OSA reported higher CPGS-FD (M=5.3±3.5) than women without OSA (M=4.2±3.5), while men with OSA reported lower CPGS-FD (M=2.7±3.1) than men without OSA (M=4.2±4.0).
Conclusion: Demographic, mood and insomnia variables affect pain experience in OSA patients. Pain experience in men and women with CPC appears to be differentially affected by OSA.
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0909

CORTISOL REACTIVITY TO EXPERIMENTAL PAIN AND PSYCHOLOGICAL STRESS IN FACIAL PAIN: MODERATING EFFECTS OF SLEEP

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Introduction: Approximately 60% of individuals with temporomandibular joint disorders (TMD) report sleep disturbance. Dysregulation of the hypothalamic-pituitary-adrenocortical (HPA) system is common in TMD, but less is known about the effects of stressor type on HPA response. The present study measured salivary cortisol reactivity to quantitative sensory testing (QST) and to the Trier Social Stress Test (TSST) in a sample of TMD patients. It was hypothesized that poor sleep would amplify the effect of each type of stressor on cortisol reactivity.
Methods: TMD patients (N=33) completed QST and the TSST on two separate afternoons. Testing order was randomized. Salivary cortisol responses were measured at baseline, immediately post-testing, 15-, 20-, 25-, 30-, and 45-minutes post-testing. Psychosocial measures, including the Pittsburgh Sleep Quality Index (PSQI), were completed at baseline. Data was assessed for normality and heteroscedasticity, and cortisol levels were log-transformed. Two-level linear mixed effects models were analyzed in R with package lme4 to assess the effect of task on cortisol levels, controlling for time of day, baseline cortisol, age, sex, race, and education level. PSQI global score, subscales, and sleep duration were examined as moderators in separate models.
Results: TMD participants (Mage=33.5 + 10.1 years, 70% female, 64% white) endorsed poor sleep quality (PSQI global: μ=7.4, SD=3.6) and short sleep duration (M=6.4 + 1.4 hours). Salivary cortisol reactivity was greater following the TSST (t(350)=7.69, p<.001). PSQI sleep disturbance (t(348)=-2.36, p<.05) and sleep duration (t(348)=-2.04, p<.05) moderated the effect of task on cortisol reactivity; greater sleep disturbance was associated with greater cortisol reactivity to QST. Longer sleep duration was associated with lower cortisol reactivity for both tasks.
Conclusion: In our TMD sample, psychological stress produced greater stress reactivity than experimental pain. Greater sleep disturbance amplified stress reactivity to acute pain, but not to psychological stress. This finding is consistent with the literature on the deleterious effects of poor sleep on endogenous pain modulatory systems (i.e., hyperalgesia). Conversely, longer sleep duration attenuates the negative effects of both psychological and pain-related stress. Consequently, this study provides support for the importance of sleep as a protective factor in mitigating the harmful effects of stress in the context of chronic pain.
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0910

EXAMINING RELATIONSHIPS OF PAIN CHRONICITY AND SLEEP DISTURBANCES IN ADULTS WITH SKIN PROBLEMS

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Introduction: Patients with chronic pain report comorbid sleep challenges (sleep fragmentation/reduced duration). Research suggests sleep disturbance in individuals with skin/subcutaneous conditions, notably insomnia. Psychological/physiological symptomology with poor disease management can lead to self-medication, possibly exacerbated from compromised sleep. The objective of this study was to examine relationships between sleep, skin conditions, and pain chronicity relative to demographics and substance use.

Methods: Adult self-reported data (N=34,525; mean age 48; 55.8% female) from 2012 National Health Interview Survey(NHIS) were used. Sleep disturbance was categorized as < 7hr sleep, insomnia/trouble sleeping, or excessive sleepiness in the past year. Skin problem type was classified as eczema/skin allergy only(n=1908), non-specified skin problem only(n=1517), eczema/skin allergy and non-specified skin problem(n=569), and none(n=30531). Chi-square test for association, Kruskal-Wallis H test, and logistic regression were performed.
Results: Individuals with skin problems(n=3994) reported chronic pain(21.5%) and sleep issues (insomnia(35.4%); excessive sleepiness(27.1%); sleep duration < 7hr(33.7%) and >9hr(5.3%)). There were significant relationships between skin problem type and chronic pain X2(3,N=34525)=564.87,p<.001) and sleep disturbance (< 7hr nightly, insomnia, or excessive sleepiness) X2(3,N=34,525)=391.04,p<.001). Pain and sleep disturbance were significantly associated X2(1,N=34,525)=1184.84,p<.001). Multinomial logistic regression was performed to examine effects of age, sex, race, smoking initiation age, excessive tobacco/alcohol use, skin problem type, and sleep disturbance on the likelihood that participants have chronic pain. The model was significant, X2(9)=816.14,p=.0001 and explained 10% (Nagelkerke R2) of the variance in chronic pain. Predictor variables of sex, excessive tobacco/alcohol use, sleep disturbance, and skin problem type were statistically significant. Individuals of increasing age, female, and having any skin problem type, especially multiple, were more likely to report chronic pain. Sleep disturbance didn't predict chronic pain, even when duration, insomnia, and excessive sleepiness were replaced separately for sleep disturbance in the model.
Conclusion: Although adults with skin problems report various sleep disturbances and substance use, pain chronicity is better predicted by sex, comorbid skin issues, and age. The relationships between sleep and chronic pain in individuals with skin/subcutaneous disorders need further exploration to focus prevention efforts/treatments. Understanding whether various sleep issues, comorbid with pain, possibly signal development/presence of skin cancer is important, as research links melanoma with obstructive sleep apnea.
Support (if any):

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0911

CHARACTERIZING SLEEP, PAIN, AND OPIOID CRAVING IN PEOPLE WITH CHRONIC LOW BACK PAIN ON LONG TERM OPIOID THERAPY

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Introduction: Previous studies have demonstrated that long-term opioid use alters sleep architecture and continuity. Long-term opioid therapy (LTOT) is common amongst people with chronic pain, yet the interrelations of sleep and pain among patients on LTOT are poorly understood.
Methods: We characterized sleep amongst people with chronic low back pain (CLBP) on LTOT (n=53) using wireless sleep-electroencephalography (EEG), and ecological momentary assessment (EMA) in a naturalistic remote study. The relationships amongst the duration and percentages of rapid eye movement (REM) and slow wave sleep (SWS), total sleep time (TST), sleep efficiency (SE), wake after sleep onset (WASO), pain, and opioid craving, measured using 14 days of EMA assessments were explored. Opioid craving was assessed through two questions which asked participants to rate how much they wanted to use opioids and the strength of their urge to use opioids. These items were averaged into one craving measure. Sleep-EEG data were averaged across two nights (when available) and separate linear regression analyses were used to determine the relationships between sleep predictors (architecture and continuity metrics) and 14-day averages of pain and opioid craving.
Results: Participants demonstrated poor sleep continuity, with substantial WASO (mean=148, SD=101 mins), short TSTs (mean=5.40, SD=2.16 hours), and low SE (mean=61.35%, SD=19.98%). However, REM% (mean=15.16%, SD=9.23%) and SWS% (mean=20.99%, SD=15.36%) were generally within normative ranges. Regression models demonstrated no significant relationship between the sleep architecture variables and pain or opioid craving. However, a strong positive correlation between pain and opioid craving (r=0.57, p< 0.01) was present.
Conclusion: Participants with CLBP on LTOT demonstrate poor sleep continuity, despite sleep architecture within normative ranges. Although we observed no relationship between sleep and pain or opioid craving, there was a strong relationship between pain and craving. Future studies should evaluate the temporal dynamics of sleep, pain, and opioid craving in this population, as well as the potential role of opioid dose and use patterns.
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0912

THE ASSOCIATION BETWEEN SOMATIZATION AND SLEEP

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Introduction: Somatization, the experience of having somatic symptoms (e.g., pain, fatigue, dizziness) with resultant psychological distress, has been described among working adults and contributes to work-related absences. Whether somatization affects employees' sleep quality and sleep duration is unclear. We examined the association of somatization with sleep quality and duration.
Methods: Data came from the 4th wave of the multi-site Worksite Blood Pressure Study, which assessed psychological factors and ambulatory blood pressure. A total of 472 participants without major cardiovascular disease from 10 worksites in NYC were recruited across 4 waves and ~11 years. At Wave 4, participants completed the Brief Symptom Inventory (BSI) and a sleep questionnaire derived from the Sleep Heart Health Study. Items from the BSI were averaged and T-scored (normed to mean=50, SD=10). Items assessing sleep quality were averaged (higher scores indicated worse sleep quality). Weekday sleep duration was also reported using a one-time sleep diary. Analyses were restricted to participants providing complete data (N= 238). Linear regression models were specified predicting (1) sleep quality and, separately (2) sleep duration from somatization. Covariates were age, sex, race/ethnicity, body mass index, marital status, years of education, family income, employment status, and average work hours per week.
Results: Of the 238 participants, 79.8% were male, 11.8% were Black, 5.9% were Hispanic/Latinx, and 76.5% were married.

Median family income was $70,000-$79,999. Mean age was 52.4 years (SD=8.1), mean years of education was 17.9 (SD=3.1), mean body mass index was 27.9 kg/m2 (SD=3.8), and mean hours worked per week (among those currently employed; n=191) was 42.0 (SD=10.9). Mean somatization score was 49.5 (SD=9.3), mean sleep quality was 8.4 (SD=4.3), and mean sleep duration was 6.5 hours/night (SD=1.1). Higher somatization scores were significantly associated with worse sleep quality, B=0.15, 95% CI 0.09, 0.20, p< 0.001. The association of somatization with sleep duration was not significant, B= 0.01, 95% CI -0.00, 0.02, p=0.18.
Conclusion: There was an association between somatization and sleep quality but not with sleep duration. Future research should examine whether treatment modalities for somatization among working adults improve sleep quality and overall occupational health.
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0913

INTERACTION BETWEEN SLEEP DURATION AND TROUBLE SLEEPING ON DEPRESSION AMONG U.S. ADULTS, NHANES 2015-2018

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Introduction: To examine the interaction effects of sleep duration and trouble sleeping on depression among U.S. adults.
Methods: We used data from the National Health and Nutrition Examination Survey (NHANES) from 2015 to 2018 (N=10,044). Trouble sleeping was self-reported. Sleep duration was determined as short (≤ 6 hours) or long (≥ 9 hours), compared with normal (>6 and < 9 hours). Depressive symptoms were defined as the Patient Health Questionnaire-9 score ≥ 10. Both multiplicative interaction and additive interaction were assessed.
Results: A significant positive additive interaction between short sleep duration and trouble sleeping on depression was observed in the fully adjusted model (Relative excess risk due to interaction, RERIOR=4.42, 95% CI: 1.12, 7.73), with 43% of the association with depression attributed to the interaction (attributable proportion of interaction, AP=0.43, 95% CI: 0.22, 0.64). Similarly, there was a significant positive additive interaction between long sleep duration and trouble sleeping on depression after adjustment (RERIOR= 4.17, 95% CI: 0.96, 7.38), with 41% of the association with depression attributed to the interaction (AP=0.41, 95% CI: 0.21, 0.60). No multiplicative interaction between short or long sleep duration and trouble sleeping was detected.
Conclusion: Different aspects of sleep health interact synergistically, accounting for a substantial portion of the association with depression. It is crucial to simultaneously consider multiple dimensions of sleep health when examining their relationship with depression.
Support (if any):

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0914

RETROSPECTIVE REVIEW OF SEDATIVE USE ON HOSPITALIZED PATIENTS AT RISK FOR OSA

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Introduction: There has been prevalent usage of sedatives and narcotics in the United States, specifically in the Appalachia. Obstructive sleep apnea (OSA) has proved to be associated with significant cardiopulmonary consequences. This study aimed to examine the effects that sedatives and/or narcotics have on the length of stay (LOS) and 6-month mortality rates of patients screened and diagnosed with OSA.
Methods: A retrospective analysis was conducted on hospitalized patients who were screened positive for OSA and had used some form of sedative. The patients were divided into three groups: patients with OSA and on sedatives chronically at home or in the hospital; patients with OSA not on sedatives; and controls with no OSA or use of sedatives. The variables studied included 6-month mortality rate and LOS. Demographics, comorbidity and medication information were also recorded for these patients.
Results: Of the patients screened from August 2019 to May 2021, 156 patients were with OSA and used sedatives, while 278 were diagnosed with OSA but no use of sedatives. There were 88 patients negative for OSA or sedatives. The patients who had OSA and used sedatives had the highest 6-month mortality rate of the three groups. Specifically, these patients had a 6-month mortality rate of 14%, compared to the other two groups, which both had 6-month mortality rates of 3%. Moreover, the patients who used sedatives had significantly longer LOS (10.06 days versus 5.97 days) than those who were diagnosed with OSA but did not use any sedative. Those without OSA had a LOS of 5.23 days. Both age-unadjusted and age-adjusted Charlson comorbidity were similar amongst all groups.
Conclusion: Hospitalized patients' high risk for OSA and on sedatives have significantly higher 6-month mortality rates and LOS. To improve quality of care and healthcare utilization, practitioners should take caution when providing sedatives to patients with OSA and consider alternative therapies. To elucidate underlying mechanisms, further prospective studies would be necessary.
Support (if any):

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0915

ACTUAL CONDITION SURVEY OF OBSTRUCTIVE RESPIRATORY EVENTS IN CONVALESCENT POST-STROKE PATIENTS WITH DYSPHAGIA

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Introduction: Sleep related breathing disorder is one of the risk factors for stroke. In addition, post-stroke patients often have dysphagia. Although sleep related breathing disorder and dysphagia occur in the oropharyngeal region, their relationship is not well defined and understudied, especially during the recovery phase. This study investigated the oral intake level and obstructive respiratory events in post-stroke patients with dysphagia.
Methods: Seventy post-stroke patients (36 men; mean age ± S.D., 72.1 ± 11.1) who were hospitalized in a rehabilitation hospital between August 2021 and October 2023 were recruited for this study. Age, sex, body height, body weight, and scores of the functional oral intake scale (FOIS) were collected from their medical record. The body mass index (BMI) was calculated from their height and weight. FOIS was used to evaluate swallowing function. The apnea hypopnea index (AHI), 3% oxygen desaturation index (3%ODI), minimum oxygen saturation (min SpO2) was assessed to evaluate the severity of obstructive respiratory events using WatchPAT (Philips Japan, Ltd.), a portable device to test to diagnose sleep related breathing disorder. In the statistical analysis, we classified the FOIS into three groups: 7 points (no dysphagia), 6,5,4 points (ingestion of texture-modified diet), and 3,2,1 point (mainly feeding through tube). And Kruskal Wallis test was performed on AHI, 3%ODI, minSpO2.
Results: We obtained approval from our ethical committee before starting this study. According to the analysis, there was a significant difference between the groups in FOIS, AHI and min SpO2 ($p < 0.05$).
Conclusion: We showed that poorer oral intake was associated with worse obstructive respiratory events. Our results suggest that clinicians should pay attention to sleep related breathing disorder in post-stroke dysphagia patients in rehabilitation hospitals, also to prevent stroke recurrence.
Support (if any):

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0916
SLEEP DIAGNOSIS, POLYSOMNOGRAPHY FINDINGS, AND CPAP ADHERENCE IN PEOPLE LIVING WITH HIV AND CONTROLS

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Introduction: Human Immunodeficiency Virus (HIV) infection remains a significant health challenge, particularly due to the global effects on health, social impact, and overall well-being. Studies on people living with HIV (PLWH) have identified that sleep disturbance interfere with quality of life, medication effect, comorbidities and disease progression, however, there is scarcity on sleep studies presenting objective polysomnographic (PSG) data and adherence to CPAP. In the current study we present clinical and PSG data in PLWH.
Methods: Observational, longitudinal study on PLWH and controls referred to a single sleep center due to suspicion of OSA. A home sleep apnea test (HSAT), full night PSG, or split night study. All PLWH were on combination antiretroviral therapy. Data obtained included clinical history, sleep study data, Epworth sleepiness and CPAP adherence at the first follow up visit.
Results: A total of 62 PLWH (48 male, 14 female) and 156 controls (91 male, 65 female) were included. In the PLWH, 30 patients underwent HSAT, 15 full diagnostic PSG, and 17 split night studies. In the PLWH group, 89% had OSA, 63% insomnia, 40% restless sleep and 21% restless legs syndrome. Data from the 32 lab studies showed statistically increased periodic limb movement index (PLMI) in PLWH (mean±SD) 33.8±31.73 than controls 10.7±17.41. A significantly higher number of PLWH had PLMI >15 hour than controls in the titration part of the study (64.7% vs. 35.5%, respectively; chi-square 3.85, $p < 0.05$). There were no other statistically significant differences in the sleep parameters. Adherence to CPAP was completed in 41 PLWH and 95 controls. Finally, pooling together all studies, PLWH showed lower adherence to CPAP (61.4±33.63% vs. 79.0±26.90%, respectively, t-value -3.248, $p< 0.0015$) and shorter time of its use (4.9±2.44 hours vs. 5.7±1.93 hours, respectively, t-value -2.038, $p < 0.044$) than controls.
Conclusion: This study shows that PLWH have elevated frequency of OSA, insomnia, restless sleep and restless legs syndrome. Objective data with in-lab studies surprisingly showed increased index of PLMS, not resolving with titration. Follow up on patients with OSA showed lower adherence to CPAP than controls.
Support (if any):

Abstract citation ID: zsae067.0917

0917
EXCESSIVE DAYTIME SLEEPINESS AND HEALTH-RELATED QUALITY OF LIFE IN ADOLESCENT PATIENTS WITH PCOS

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Introduction: Patients with polycystic ovary syndrome (PCOS) have been reported to have an impaired quality of life (QoL). A high prevalence of sleep disorders has also been reported in this group. This study seeks to evaluate the degree of excessive daytime sleepiness and sleep related QoL in adolescent patients with PCOS.
Methods: Patients seeking treatment at our multidisciplinary PCOS clinic who were evaluated by Sleep Medicine from July 2023 to December 2023 and completed the Epworth Sleepiness Scale for Children and Adolescents (ESS-CHAD) and OSA-18 questionnaire were included in this study. The ESS-CHAD is an 8 question, validated measure of daytime sleepiness in children 12-18. Scores >10 suggest excessive sleepiness. The OSA-18 is an 18-item questionnaire that uses a Likert-type scoring system to collect information about 5 subscales that are elements in QoL: sleep disturbance, physical symptoms, emotional symptoms, daytime function, and caregiver concerns. A summary score is calculated that ranges from 18 (no impact on QoL) to 126 (major negative impact). Scores lower than 60 suggest a mild impact on QoL, scores between 60 and 80 suggest a moderate impact, and scores greater than 80 suggest a large impact. Descriptive statistics include means (SD) and n (%).

Results: Sixteen subjects, mean age 16.68 years (SD 1.65), mean BMI 41.8 (SD 11.02) met inclusion criteria. Ten (62%) reported excessive daytime sleepiness as assessed by the ESS-CHAD. OSA-18 scores ranged from 23 to 84 with 2/16 (12.5 %) of subjects having a moderate or severe impairment and 14/16 (87.5%) subjects having a mild impairment.
Conclusion: Among adolescent patients seeking treatment at a multidisciplinary PCOS clinic, the majority reported excessive sleepiness with mild impact on their QoL as assessed by disease specific questionnaires. Future studies will further investigate the contribution of sleep disordered breathing and evaluate the impact of obesity and insulin resistance on excessive sleepiness and health related QOL as measured by ESS-CHAD and OSA-18 scores.
Support (if any):

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0918

A CROSS-SECTIONAL STUDY ON THE CYTOKINE PROFILES AND IMMUNOLOGICAL RELATIONSHIP BETWEEN VITILIGO AND SLEEP QUALITY

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Introduction: Vitiligo is an autoimmune skin disease. Psychological disruption can lead to clinical worsening and impact sleep quality of patients, in a bidirectional manner. Sleep regulates the immune system, and cytokines expression, including interleukin (IL)-6 and IL-17A (pro-inflammatory) and IL-4 and IL-10 (anti-inflammatory), which are linked to circadian rhythm and vitiligo immunopathogenesis. This study aimed to analyse cytokine profiles in a vitiligo sample; and verify any association with subjective sleep.
Methods: The study comprised 30 patients with vitiligo, and 26 healthy controls, following ethical guidelines. Quality of life and sleep questionnaires were completed: Dermatology Life Quality Index (DLQI), Short-Form Health Survey (SF-36), Pittsburgh Sleep Quality Index (PSQI) and Insomnia Severity Index (ISI). Seven serum cytokines were measured through a 7-plex kit: IFN-γ, IL-4, IL-6, IL-10, IL-12 p40, IL-17A and TNF-α. Previous treatment with ultraviolet B phototherapy was registered. Generalized Linear Model test was used for statistical analysis.
Results: PSQI total score and domain 4 (sleep efficiency) were statistically worse in the vitiligo sample (both p=0.01). The PSQI means were 9.07 (vitiligo) and 6.66 (controls). Final scores of SF-36 and ISI were not statistically different between groups, although numerically worse in vitiligo group. The SF-36 domains "body pain", "social aspects", "physical limitation" and "emotional limitation" were statistically worse in vitiligo group. The DLQI mean (vitiligo group) indicated mild to moderate impact on quality of life (5.57). Cytokine levels were not different between groups, nor when analysed with PSQI. Regarding ISI, higher scores were related to increased IL-17A in vitiligo group (p=0.01). Increasing IL-4, IL-6 and IL-10 were associated with previous phototherapy (p=0.03; p=0.03 and p=0.04, respectively).
Conclusion: The vitiligo group presented worse sleep, as expected. Body pain predominated in vitiligo sample; hyperalgesia can occur in poor sleep, impairing quality of life. Emotional limitation can be enhanced by or aggravate physical limitation and pain. Elevated ISI scores (more severe insomnia) were related to increased IL-17A levels. The IL-4, IL-6 and IL-10, with circadian behaviour, were associated to phototherapy, which has immunomodulatory role. Poor sleep and impaired vitiligo may interact bidirectionally; cytokine regulation should be further investigated in this complex relationship.
Support (if any): AFIP, CAPES, CNPq and FAPESP.

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0919

SHAKING UP THE NIGHT: PCD & SLEEP-RELATED MOVEMENT DISORDERS

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Introduction: Primary Ciliary Dyskinesia (PCD) is a rare genetic condition characterized by oto-sino-pulmonary pathologic manifestations with multiple comorbidities, including sleep-related disorders. The literature on sleep movement disorders in PCD is limited, especially for Hispanics. This pilot study aims to assess the presence of sleep movement disorders and other comorbidities in patients with the RSPH4A PCD founder mutation [c.921 + 3_921 + 6delAAGT] in Puerto Rico. Our specific aim is to identify sleep-related movement disorders in PCD patients with the Puerto Rican founder mutation. Recognizing the importance of early diagnosis and prevention of PCD-related sleep disorders in pediatric and adult patients with PCD will help increase the knowledge of this condition and its comorbid manifestations.
Methods: We performed a prospective case series of fourteen PCD patients (n=15; seven pediatric and eight adults) at the Puerto Rico PCD Center and Neurosleep Sleep Laboratory in San Juan, Puerto Rico. Both pediatric and adult patients were interviewed for sleep disturbances and sleep-related movement during the night. Sleep questionnaires such as the Epworth Sleepiness Scale, and STOP-Bang (including the Pediatric Modified) were administered. Finally, polysomnography (PSG) was performed on every PCD patient to evaluate for sleep-related disorders.
Results: Our preliminary data showed that most patients with RSPH4A [c.921 + 3_921 + 6delAAGT] PCD founder mutation presented a high risk for sleep-related movement disorders or manifestations, including Sleep-Related Bruxism, Periodic Limb Movement of Sleep, Hypnagogic Foot Tremor, Rhythmic Movement Disorder. However, there were additional manifestations presented in both history-taking and PSG results such as Alpha-Delta Sleep, NREM Parasomnias, and others presented with Obstructive Sleep Apnea.
Conclusion: PCD is a rare genetic condition characterized by oto-sino-pulmonary pathologic manifestations with multiple comorbidities, including sleep-related disorders. The mechanism for the development of sleep-related movement disorders due to this ciliopathy is not well understood. Further research involving Multiple Sleep Latency Tests, Actigraphy, and additional comprehensive neurophysiologic testing and evaluation is needed to make an early diagnosis and prevent further clinical deterioration. Additional studies are needed in multicentric clinical trials to answer whether these sleep manifestations are related to a neurodevelopmental or neurodegenerative process due to this rare ciliopathy like PCD.
Support (if any):

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0920

SLEEP HEALTH AND COGNITIVE SYMPTOMS IN ADULTS WITH INFLAMMATORY BOWEL DISEASE

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Introduction: Inflammatory bowel disease (IBD) is a chronic immune-mediated disease that includes Crohn's disease and ulcerative colitis. People with IBD experience poor sleep health, including short and highly fragmented sleep and extraintestinal manifestations including alterations to cognitive functioning; however, the relationships between sleep health and cognitive symptoms have not been evaluated in this population. The purpose of this study was to identify the associations between sleep health and perceived cognitive impairments in adults with IBD.
Methods: We conducted a descriptive, correlational study of adults (18 to 59 years old) with IBD. We used the Pittsburgh Sleep Quality Index (PSQI) to obtain self-reported data on sleep health, the FACT-Cog Perceived Cognitive Impairments questionnaire to elicit cognitive symptoms, and the Manitoba IBD Index to describe IBD disease activity. Descriptive statistics, point-biserial correlations, and Pearson's correlations were used to describe relationships.
Results: Of the 59 participants [Mean age 40.8 (SD 10.5), 71.2% female, 94.9% white], 67.8% (n=40) had clinically active IBD. 79.7% (n=47) had a PSQI total score >5, indicating poor sleep health. The most common cognitive symptoms, occurring two or more times a week, were trouble concentrating (55.9%), walking into a room and forgetting an intended task (44.1%), and forgetting the names of people soon after being introduced (44.0%). PSQI total score was positively and significantly correlated with 12 of 13 questions on the FACT-Cog. The strongest correlations included trouble concentrating (r = .497, P<.001), slower thinking (r = .450, p<.001), trouble forming thoughts (r=.550, p<.001), and difficulty finding the right words to express oneself (r=.546, p<.001). Longer self-reported sleep latency was associated with higher frequency of 12 out of 13 cognitive symptoms, while sleep efficiency was associated with 4 and sleep duration was associated with 2. Having clinically active IBD was associated with trouble forming thoughts (r=-.261, p=.046), slower thinking (r=-.307, p=.018), and trouble concentrating (r=-.346, p=.007).
Conclusion: Cognitive symptoms are common among people with IBD, highly correlated with sleep health, and not fully explained by IBD disease activity. Future studies should include objective measures of sleep health and cognition to further elucidate these relationships.
Support (if any): Mayo Clinic Bonner Fund

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0921

PILOT COGNITIVE BEHAVIORAL SLEEP HEALTH RANDOMIZED CONTROLLED TRIAL FOR YOUNG ADULTS WITH TYPE 1 DIABETES

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Introduction: Short sleep duration and inconsistent timing have been linked to poor glycemic target achievement and greater comorbidities in individuals with type 1 diabetes (T1D), particularly adults aged 18-26 years who achieve glycemic targets at the lowest rates (only 14%). Preliminary evidence supports cognitive behavioral sleep interventions (sleep extension + timing consistency) in improving the achievement of sleep and glycemic targets. The purpose of this pilot randomized controlled trial (RCT) was to determine the preliminary effects of a cognitive behavioral sleep health self-management intervention (CB-Sleep Health - sleep extension + timing consistency) on self-report and objectively derived sleep health dimensions (satisfaction, alertness, timing, efficiency, and duration) in young adults with T1D.
Methods: Young adults with T1D for at least 6 months with a hemoglobin A1C ≥ 7% or ≤ 80% time in glucose range were randomly assigned 1:1 stratified by sex at birth to a 12-week CB-Sleep Health (n = 21) or time balanced attention control (AC) condition (n = 18). Participants completed the Pittsburgh Sleep Quality Index (sleep satisfaction) and trail making test (daytime alertness) while concurrently wearing continuous glucose monitors and research grade actigraphy (timing, efficiency, and duration) for 14 days at baseline, post-intervention, and a 3-month follow up.
Results: Thirty-nine young adults (mean age 21, BMI 25.9 kg/m2, A1C 8.5% and 44% time in glucose range, 59% male, 26% Non-White - 18% Black/8% other race) participated. Baseline sleep health dimension values (mean + sd) were 5.4 + 0.7 vs. 5.3 + 0.5 score (satisfaction), 18.4 + 1.4 vs. 20.3 + 1.3 seconds (daytime alertness), 16:07 + 0.4 vs. 15:95 + 0.4 hours (timing), 85.6 + 4.1% vs. 84.7 + 4.5% (efficiency), and 6.4 + 1.0, vs. 6.9 + 1.0 hours (duration) for CB-Sleep Health vs. AC respectively. Sleep duration and alertness improved for CB-Sleep Health compared to AC post intervention (+18 minute vs. -25.8 minutes, p = .01 and -3.92 seconds vs. +0.71, p = .005) and were sustained at the 3-month follow up.
Conclusion: Preliminary effects of a CB-Sleep Health intervention on sleep duration and alertness without impairing efficiency for young adults with T1D are encouraging.
Support (if any): National Institute of Nursing Research (R00NR018886)

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0922

ASSOCIATIONS BETWEEN SLEEP DISTURBANCES AND PTSD SYMPTOMS IN YOUNG ADULTS

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Introduction: Post-traumatic stress disorder (PTSD) and sleep are bi-directionally linked. Past research on the association between sleep and PTSD has largely focussed on older military populations aged 30 or above, which created a gap in understanding this relationship in younger civilian populations. In addition, individual and trauma-related factors in this demographic have been mostly overlooked. In this study, we addressed this gap by examining the association between sleep disruptions and PTSD symptoms in a young university student cohort with diverse, non-military trauma histories. In addition, we explored moderating factors such as biological sex, chronotype, and trauma chronicity and investigated the link between sleep disturbances and PTSD symptom clusters (re-experiencing, hyperarousal, avoidance, and negative mood).
Methods: A total of 634 university students (female: 491, male: 143) with a mean age of 19.83 years (SD = 4.71) completed the study. Among them, 283 students reported experiencing at least one traumatic event. Participants completed an online questionnaire to assess trauma history, PTSD symptom severity, sleep disturbances (sleep quality, insomnia, and sleepiness), chronotype, and levels of depressive and anxiety symptoms.
Results: There was a significant positive association between sleep disturbances and PTSD symptom severity, $F(3, 279) = 48.68$, $p < .001$, $R2 = .34$ in trauma-exposed adults with and without likely PTSD. However, this relationship was not moderated by any of the hypothesised factors ($p > .05$). Nonetheless, there was a significant positive relationship between sleep disturbances and all four PTSD symptom cluster: re-experiencing ($b = 0.32$, $p < .001$), hyperarousal ($b = 0.34$, $p < .001$), avoidance ($b = 0.53$, $p < .001$), and negative mood ($b = 0.24$, $p < .001$).
Conclusion: The association between sleep and PTSD in this young adult population with mixed-trauma exposures aligned with the previously observed findings in older military veterans. The increasing severity of sleep disturbances as a predictor for PTSD symptom severity further suggests that sleep is a potential etiological factor contributing to the onset and persistence of PTSD. These results bear significant treatment implications, emphasizing the potential to address sleep-related issues in interventions targeting PTSD.
Support (if any):

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0923

PROSPECTIVE BIDIRECTIONAL RELATIONSHIP BETWEEN SLEEP DURATION AND PTSD SYMPTOMS FOLLOWING ACUTE CORONARY SYNDROME

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Introduction: Sleep disturbance is a "hallmark" symptom of posttraumatic stress disorder (PTSD). Poor sleep (including short sleep) after combat-related trauma can also predict subsequent PTSD. Less is known about the association between sleep duration and PTSD when PTSD is induced by an acute health-related event. We examined the bidirectional relationship between sleep duration and PTSD symptoms over the year following hospital evaluation for acute coronary syndrome (ACS).
Methods: Participants were enrolled in this observational study after emergency department evaluation for ACS. Sleep duration ("During the past month, how many hours of actual sleep did you get at night?") and PTSD symptoms related to the cardiac event/hospitalization (PTSD Checklist; PCL) were assessed at 1-, 6-, and 12 months after hospital discharge. Cross-lagged path analysis was used to model the effects of sleep duration and PTSD symptoms on each other. Covariates included age, sex, race/ethnicity, cardiac severity, baseline depression symptoms, and early acute stress disorder symptoms.
Results: The sample included 1,145 participants. Mean (SD) age was 61.4 (12.6) y and 46.5% were female. Mean sleep duration was ~6.1 hours, with ~57% of participants reporting short sleep duration (i.e., < 7 hours). Mean PCL score was ~24.19, with ~16% of participants screening positive for probable PTSD related to the cardiac event/hospitalization (PCL score ≥33) at each assessment (17.2%, 16.3%, and 15.7% at 1-, 6-, and 12 months). Higher PTSD symptoms predicted shorter sleep duration at the next timepoint (i.e., 1 to 6 months and 6 to 12 months), B=-0.14 hours/10-point difference, se=0.03, p<.001. Shorter sleep duration was associated with higher PTSD symptoms at the next timepoint, B=-0.25 points/hour, se=0.12, p=.04. Results were similar when insomnia and nightmare items were removed from the PCL. Higher dream-related PTSD symptoms (i.e., nightmares) had a marginally significant association with shorter sleep at the following assessment, B=-0.09 hours/point, se=0.05, p=.057. Shorter sleep was significantly associated with higher dream-related PTSD symptoms at the next timepoint, B= 0.03 points/hour, se=0.01, p=.001.
Conclusion: Short sleep duration and PTSD symptoms are mutually reinforcing across the year following ACS evaluation. Findings suggest that sleep, PTSD symptoms, and their relationship should be considered in the post-ACS period.
Support (if any):

Abstract citation ID: zsae067.0924

0924

A 4-WEEK MORNING LIGHT TREATMENT REDUCES AMYGDALA REACTIVITY AND CLINICAL SYMPTOMS IN PEOPLE WITH TRAUMATIC STRESS

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Introduction: Trauma exposure can result in anxiety, depression, and posttraumatic stress disorder. Although psychotherapies and pharmacotherapies exist for traumatic stress, many individuals remain symptomatic. New interventions for traumatic stress that target underlying mechanisms (e.g. amygdala reactivity) and are safe and acceptable are needed. Here we report on a randomized clinical trial in which we tested 3 doses of a 4-week morning light treatment in people with traumatic stress.

Methods: Forty-two adults (32 females, 19-57 years) with traumatic stress (experienced a DSM-5 Criterion A trauma, DASS score >22, and ≥ 2 moderate hyperarousal symptoms) completed a 5-week protocol. In the first week each participant slept at home, ad lib, on their usual sleep schedule. Thereafter, they followed a fixed sleep schedule and a 4-week morning light treatment (randomized to 15 mins, 30 mins or 60 mins of light each morning). Amygdala reactivity (emotional faces task - fMRI), clinician rated symptoms (PSSI, HAM-A, HAM-D) and self-reported symptoms (PCL-5, DASS) were assessed at baseline, and after 4 weeks of morning light treatment.
Results: Amygdala reactivity (left and right, negative faces vs shapes) in all 3 morning light groups significantly reduced during treatment (ps< 0.04). The 30 and 60 min groups had larger effect sizes in the reduction in amygdala reactivity than the 15 min group (ds=0.33-0.67 vs ds=0.11-0.16). All clinical symptoms significantly reduced during the treatment (ps< 0.001). There was a trend for self-reported depression, anxiety and stress symptoms to decline the most in the 60 min group (DASS d=1.35, p=0.06). Similarly, clinician rated depressive symptoms declined the most in the 60 min group (HAM-D d=2.25, p=0.03). No significant side effects were reported. Treatment satisfaction (average 7/10) and adherence (average 91%) were similar between groups (ps>0.05).
Conclusion: Results suggest that a 4-week morning light treatment can reduce amygdala reactivity and improve clinical symptoms in people with traumatic stress. The longest duration of morning light treatment, 60 minutes, produced some of the largest reductions in self-reported depression, anxiety and stress symptoms, and in clinician rated depressive symptoms. Morning light treatment should be further explored as a feasible, acceptable and effective adjunctive non-pharmacological treatment for traumatic stress.
Support (if any): R61 MH117157

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0925

A MULTILEVEL TIME-LAGGED MEDIATION OF NIGHTMARE AND PTSD SYMPTOM SEVERITY ACROSS TIME IN A COMBINED TREATMENT

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Introduction: This study sought to contribute to understanding the role of sleep disturbances as a potential hallmark of PTSD through examining the relationship between changes in post-trauma nightmare (PTNM) severity (nightmare frequency and distress) and symptoms of PTSD over time during a combined treatment for PTSD and PTNMs.
Methods: Individuals diagnosed with PTSD and having at least weekly nightmares (n = 84) were randomized into one of three treatment conditions: 12-session Cognitive Processing Therapy (CPT) only (n = 31), CPT followed by 5-session Exposure, Relaxation, and Rescripting Therapy (ERRT) condition (n = 29; CPT+ERRT), or ERRT followed by CPT (n = 24; ERRT+CPT). Multilevel time-lagged mediation models were analyzed to examine if nightmare severity (frequency and distress) measured at an earlier time point (t1; baseline, week 6, week 12) mediated the change in PTSD symptom severity at a later time point (t2; week 6, week 12, or week 17). The reverse relationship was also explored. An exploratory aim focused on examining if the order of treatment (CPT+ERRT or ERRT+CPT) moderated the mediated relationships.
Results: Across all three treatment conditions, there were statistically significant reductions in PTSD symptom and nightmare severity over time. In the unmoderated mediation models, there were no significant indirect effects detected. When treatment order was included as a moderator, there was a conditional effect of treatment order on the indirect effects of time on nightmare severity at t2 through PTSD symptom severity at t1. Only in the ERRT+CPT condition was there a statistically significant negative relationship of time on nightmare and PTSD symptom severity at t1 (ps < .05). Furthermore, only in the ERRT+CPT condition, there was a statistically significant negative relationship between nightmare severity at t1 and PTSD symptom severity at t2. Therefore, only in the ERRT+CPT condition did PTSD symptom severity at t1 mediate the relationship between time and nightmare severity at t2.
Conclusion: These results suggest that earlier increases in PTSD symptom severity are an important mediator of change for the improvement of nightmares specific to receiving ERRT first. Clinicians may glean insight from this study that can impact shared decision making with patients on treatment planning.
Support (if any):

Abstract citation ID: zsae067.0926

0926

DREAMING BIG: LAUNCHING A WEB-BASED PROVIDER TRAINING FOR COGNITIVE BEHAVIORAL THERAPY FOR NIGHTMARES

Kristi Pruiksma[1], Allison Wilkerson[2], Daniel Taylor[3], Jessica Dietch[4], Hannah Tyler[5], William Price[5], Rebecca Campbell[3], Joanne Davis[6], Sophie Wardle-Pinkston[7], Stacey Young-McCaughan[5], Stefanie LoSavio[5], Alan Peterson[1]
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Introduction: Few providers are trained to deliver Cognitive Behavioral Therapy for Nightmares (CBT-N) despite the impact of nightmares on physical and mental health. Reduced access to treatment is partially due to limited training opportunities. Web-based training resources are valuable because they are easily accessible, are cost-efficient, and can be reviewed by providers as needed. This presentation describes the development, testing, and launch of a web-based provider training for CBT-N.
Methods: Nightmare, trauma, and sleep disorder experts collaborated to develop material for the web-based CBT-N training. Next, 17 providers tested a first draft of the web-site. After feedback was integrated, 50 providers were recruited to complete the updated draft of the website and will complete feedback in January 2024. To assess learning, providers completed multiple-choice questions before and after each of the 10 training modules. Item Response Theory (IRT) analyses were used to identify items of low discrimination and difficulty for further refinement.
Results: Overall, testers had positive reactions to the training content and website. The training content was improved by adding more figures, animations, and therapy demonstration videos and integrating more cultural considerations. Usability was improved by addressing bugs and enhancing intuitive site navigation. Based on IRT analyses of multiple-choice questions, 40

(out of a total 80) items were replaced and will be re-evaluated at the conclusion of beta testing.
Conclusion: Launching in June 2024, CBTnightmares.org is a comprehensive, engaging, and accessible training after two phases of development and feedback from almost 70 licensed providers. The final phase of testing, to be conducted in April 2024, will examine the equivalence of online training compared to a live virtual workshop (Target N = 100). Providers will complete questionnaires and a mock session with a standardized patient to examine therapist proficiency and fidelity. The hypotheses are that this web-based course will be equivalent to a live virtual workshop. This project directly addresses the dissemination and implementation cliff of empirically supported treatment for nightmares.
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0927

SHINING LIGHT ON NIGHTMARE TREATMENT: EXPERT PANEL RECOMMENDATIONS FOR COGNITIVE BEHAVIORAL THERAPY FOR NIGHTMARES

Kristi Pruiksma[1], Katherine Miller[2], Joanne Davis[3], Daniel Taylor[4], Jessica Dietch[5], Philip Gehrman[6], Michael Nadorff[7], William Brim[8], Rebecca Campbell[4], Hannah Tyler[9], William Price[9], Alan Peterson[1]
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Introduction: Few providers are trained to deliver Cognitive Behavioral Therapy for Nightmares (CBT-N) despite the impact of nightmares on physical and mental health. Reduced access to treatment is partially due to limited training opportunities. Web-based training resources are valuable because they are easily accessible, are cost-efficient, and can be reviewed by providers as needed. This presentation describes the development, testing, and launch of a web-based provider training for CBT-N.
Methods: Nightmare, trauma, and sleep disorder experts collaborated to develop material for the web-based CBT-N training. Next, 17 providers tested a first draft of the web-site. After feedback was integrated, 50 providers were recruited to complete the updated draft of the website and will complete feedback in January 2024. To assess learning, providers completed multiple-choice questions before and after each of the 10 training modules. Item Response Theory (IRT) analyses were used to identify items of low discrimination and difficulty for further refinement.
Results: Overall, testers had positive reactions to the training content and website. The training content was improved by adding more figures, animations, and therapy demonstration videos and integrating more cultural considerations. Usability was improved by addressing bugs and enhancing intuitive site navigation. Based on IRT analyses of multiple-choice questions, 40 (out of a total 80) items were replaced and will be re-evaluated at the conclusion of beta testing.
Conclusion: Launching in June 2024, CBTnightmares.org is a comprehensive, engaging, and accessible training after two phases of development and feedback from almost 70 licensed providers. The final phase of testing, to be conducted in April 2024, will examine the equivalence of online training compared to a live virtual workshop (Target N = 100). Providers will complete questionnaires and a mock session with a standardized patient to examine therapist proficiency and fidelity. The hypotheses are that this web-based course will be equivalent to a live virtual workshop. This project directly addresses the dissemination and implementation cliff of empirically supported treatment for nightmares.
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0928

SLEEP, MEDIATING THE RISK OF COGNITIVE IMPAIRMENT IN POST-TRAUMATIC STRESS DISORDER VIA NORADRENALIN DYSREGULATION

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Introduction: There is growing evidence that Post Traumatic Stress Disorder (PTSD) increases the risk of dementia, and sleep impairment in PTSD may contribute to this link. Increased cerebrospinal fluid (CSF) norepinephrine (NE) is associated with glymphatic dysfunction and poor neurocognitive outcomes. To understand the role of sleep in mediating the increased risk of dementia in PTSD, we investigated whether sleep-specific symptoms of PTSD are related to CSF NE level and cognitive function.
Methods: We analyzed a prospective study of combat Veterans with repetitive blast mild traumatic brain injury (mTBI). All underwent CSF sampling and the PTSD and DSM checklist 5 for military (PCL-M), a 17-item self-report measure reflecting DSM-IV symptoms of PTSD. We derived a sum score of each symptom cluster; Questions 1-5: "Re-Experiencing", 6-12: "Avoidance and Negative Cognition and Mood" and 13-17: "Hypervigilance". Among the 17 items, questions 2 and 13 are sleep-related symptoms. We calculated correlations of the sum score of each category with CSF NE level with and without sleep-specific questions (2: nightmare and 13: sleep disruption) with CSF NE levels. Trails A (attention and visual motor function) and Trail B (executive function) tests were performed.
Results: A total of 49 mTBI participants were included. A sum score of symptoms related to re-experiencing (r=0.34, p=0.001) and hyperarousal (r=0.3, p=0.03) were weakly correlated with elevated CSF NE. Excluding the sleep-specific symptom questions from these two categories attenuated the correlation (re-experiencing r=0.31, p=0.03; hyperarousal r=0.2, p=0.1). The scores of sleep-specific symptoms were separately examined, the correlation with CSF NE was (nightmare r=0.37, p=0.0009; sleep impairment r= 0.35, p=0.001). The symptom cluster related to avoidance and negative cognition and mood was not associated with NE level (r=0.15, p=0.9). Elevated CSF NE was strongly associated with lower Trials B performance (r=0.34, p=0.001). Trails A performance was not associated.
Conclusion: PTSD-associated sleep symptoms of nightmares and sleep disruption are most strongly associated with CSF NE. CSF NE is associated with worsening executive function measured by Trails B. Sleep symptoms may be the driver of the poor

neurocognitive outcomes in patients with PTSD. Traditional symptom clusters of PTSD may not accurately reflect the risk of cognitive function.
Support (if any):

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0929
THE ROLE OF INSOMNIA, SLEEP APNEA, AND PSYCHOLOGICAL DISTRESS ON QUALITY-OF-LIFE IN VETERANS WITH AND WITHOUT PTSD

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Introduction: Obstructive sleep apnea (OSA), insomnia, and psychological distress have been independently linked to various negative outcomes, including poorer quality-of-life (QOL). However, prior literature has not investigated differences in QOL outcomes between veterans with and without PTSD that may be influenced by sleep apnea severity, insomnia, and psychological distress. This study aimed to investigate the relationships of sleep apnea severity, insomnia, and psychological distress with QOL (i.e. physical and social functioning) between veterans with and without PTSD.
Methods: Veterans presenting to the Miami VA Sleep Center who were at risk for OSA (n=645, M age=52 years, 84.5% male) completed the Insomnia Severity Index and the PROMIS-29. The social and physical functioning subscales from the PROMIS-29 were used. Questionnaires were completed the night prior to undergoing a home sleep apnea test. Multigroup structural equation modelling was used to compare the PTSD (n=210) and non-PTSD (n=435) groups, controlling for age, gender, race, education, and BMI.
Results: The final model met statistical criteria for good fit (CFI=0.951, RMSEA=.051). For those with PTSD, higher psychological distress was associated with both reduced social (β=-.54, p<.001) and physical functioning (β=-.35, p<.001). Neither insomnia nor sleep apnea was associated with QOL outcomes in those with PTSD. In those without PTSD, higher psychological distress and higher insomnia were associated with lower social (β=-.38, p<.001; β=-.42, p<.001) and physical functioning (β=-.30, p< 001; β=-.29, p< 001). Sleep apnea was not associated with QOL outcomes in those without PTSD.
Conclusion: The present findings suggest that for those without PTSD both insomnia and psychological distress, but not sleep apnea, are associated with QOL. However, for those with PTSD, only psychological distress was related to QOL. Neither insomnia nor sleep apnea was associated with QOL in those with PTSD. These results indicate that, in those without PTSD, QOL is influenced by both a sleep disorder (insomnia) and psychological distress. However, in those with PTSD, QOL appears to be primarily influenced, not by a sleep disorder, but by psychological distress. The current findings highlight importance of and the need to prioritize treatment for psychological distress in veterans with PTSD to improve their QOL.
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0930
TRAUMA-SPECIFIC AND NONSPECIFIC PREDICTORS OF SLEEP-STATE MISPERCEPTION AMONG TRAUMA-EXPOSED WOMEN

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Introduction: Sleep disturbances are highly prevalent following trauma exposure but tend to persist following trauma-focused treatment, which brings into question the relevance of trauma-specific factors in these sleep problems. Sleep assessment can include subjective methods, like sleep diaries, and/or objective methods, like actigraphy. However, these methods tend to result in low-moderate concordance, and it has been hypothesized that clinical samples report greater sleep disturbance than objective methods record (i.e., sleep-state misperception). This may be due to greater overall distress or bias from experiencing clinical symptoms. This study examined trauma-specific and nonspecific predictors of sleep-state misperception in trauma-exposed women.
Methods: N=55 cis-gendered women with a self-reported history of sexual abuse in childhood (between ages 6-11) completed baseline surveys assessing sleep and mental health, and one week of sleep monitoring via actigraphy and sleep diaries as part of a larger study. Cohen's d was calculated to estimate the degree of sleep-state misperception between sleep diary and actigraphy.
Results: Participants tended to overestimate total sleep times (TST) and sleep onset latencies (SOL) when reported on sleep diary compared to actigraphy. In contrast, participants underestimated wake after sleep onset (WASO) via sleep diary compared to actigraphy. In examining clinical correlates of sleep-state misperception, we found that TST Cohen's d was significantly correlated with baseline depressive symptoms (r=.295, p=.029) and pre-sleep cognitive arousal (r=.269, p=.047). PTSD hyperarousal symptoms (minus the sleep item) were positively correlated with TST Cohen's d (r=.358, p=.007) but negatively correlated with SOL Cohen's d (-.279, p=.039).
Conclusion: While we observed both trauma-specific (i.e., hyperarousal) and nonspecific (i.e., depression, cognitive arousal) to be associated with sleep-state misperception, it is possible that these variables have similar underlying transdiagnostic factors. For example, rumination (a form of perseverative cognition focused on negative content) underlies both depression and PTSD. Future work should further probe contributing factors to sleep-state misperception to better understand this phenomenon.
Support (if any): This study was funded by the University of Houston Small Grants Program (PI: CAA). CJS was supported by the Department of Veterans Affairs, Office of Academic Affiliations, Advanced Fellowship in Mental Illness Research and Treatment, and the University of Houston Dissertation Completion Fellowship.

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0931
COMISA-MARES: COMORBID INSOMNIA AND OBSTRUCTIVE SLEEP APNEA WITH AND WITHOUT NIGHTMARES IN US MILITARY PERSONNEL

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Introduction: Comorbid insomnia and obstructive sleep apnea (OSA), also called COMISA, has deleterious effects on mental

and physical health. Limited research has examined the occurrence of nightmares in patients with COMISA. In a sample of service members seen in a US military sleep disorders clinic, this study examined the impact of nightmares among participants with insomnia, OSA, and COMISA and how sleep and mental health symptoms differed by sleep disorder (i.e., insomnia only, OSA only, COMISA) among those with nightmares.
Methods: In this observational study, 372 participants completed video-polysomnography and received a primary sleep disorder diagnosis (i.e., insomnia, OSA, COMISA). Participants with nightmares 1 ≥ week that woke them up at least "sometimes" were counted as having nightmares. Participants also completed measures of insomnia, anxiety, depression, and posttraumatic stress disorder (PTSD). General linear and mixed effects models were used to test our research questions.
Results: Nightmares were endorsed by 30% (n = 111) and were significantly more likely to be reported by those in the insomnia (36%, n = 42) and COMISA (38%, n = 52) groups than in the OSA group (14%, n = 17; p <.0001). Among the sleep diagnostic groups (i.e., insomnia, OSA and COMISA), participants with nightmares had significantly increased insomnia, anxiety, depression and PTSD symptoms compared to those without nightmares. Participants with COMISA and nightmares (i.e., COMISA-MARES) had the worst overall symptoms.
Conclusion: We propose COMISA-MARES as the combination of three sleep disorders that manifests with the worst overall sleep and mental health symptoms in military personnel. Given the high diagnostic rate, military and veteran sleep clinics should incorporate insomnia and nightmare assessments in efforts to better characterize this disorder. COMISA is significantly more burdensome than OSA alone and insomnia alone, and nightmares pose an even greater additive element of burden. Research is needed to guide treatment.
Support (if any): This work was supported by the Defense Health Agency, Defense Medical Research and Development Program, Clinical Research Intramural Initiative for Military Women's Health (DM170708; Mysliwiec) and the US Air Force (USAF) Air Force Materiel Command (AFMC), Wright Patterson Air Force Base, Ohio (FA8650-18-2-6953; Peterson).

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0932

COMPARISON OF LANGUAGE AND SOMATIC EXPERIENCES BETWEEN REPORTS OF TRAUMA & TRAUMA-RELATED DREAMS

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Introduction: Trauma-related nightmares (TRNs) are common sequela of psychological trauma. We explored linguistic and somatic-experience differences between self-reports of a trauma and those of nightmares related to the trauma.
Methods: Seventeen participants with varying severity of PTSD symptoms reporting recurring TRNs (mean age 27, 14 females) recalled traumatic experiences and nightmares related to that trauma. Trauma reports were written by participants, while nightmare reports were transcribed from audio recordings made as soon as the nightmares were recalled. Following reports, participants indicated co-occurring somatic experiences by choosing from a predetermined list. Choices were later grouped into cardiovascular, respiratory, interoceptive, and tension categories. Linguistic content was measured using the Linguistic Inquiry and Word Count (LIWC) program and words were grouped into positive emotion (positive tone, prosocial, power, affiliation), negative emotion (negative tone, anxiety, anger, sadness, conflict), and somatosensory (visual, auditory, feeling) categories. Shapiro-Wilk tests showed non-normally distributed data therefore nonparametric tests (Wilcoxon Signed-Rank Test, Spearman Correlation) were used. Because trauma reports had significantly higher word counts than TRNs (p=0.0495), LIWC data were normalized for word count. Total and symptom-cluster severities were assessed using the PTSD check list for DSM-5 (PCL-5).
Results: We found significantly more somatic experiences of interoception (p=0.0084) and tension (p=0.024) in trauma versus nightmare reports but no differences in cardiovascular or respiratory experiences. No differences between report type were found for LIWC categories. The PCL-5 Intrusion (cluster B) PTSD symptoms were associated with cardiovascular (rho=0.592, p=0.0156) and respiratory (rho=0.619, p=0.0109) experiences in trauma reports and interoception (rho=0.718, p=0.0033) and tension (rho=0.556, p=0.0224) experiences in nightmare reports. No other symptom clusters, nor PCL-5 total score, were correlated with other somatic-experience categories. No LIWC categories in either report type were correlated with symptom clusters or total PCL-5 score.
Conclusion: More somatic experiences of interoception and tension were recalled from traumas than TRNs. Because the brain is relatively deafferented from sensory input during dreaming, we expected, but did not find, state differences in other somatic experiences. Word categories in narratives also did not show state differences. Only the intrusion symptoms of PTSD predicted bodily sensations in trauma as well as TRN reports.
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0933

DREAMING UNDER ANESTHESIA OCCURS DURING PRE-EMERGENCE STATE

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Introduction: Dreaming during anesthesia is defined as any recalled experience that occurs between induction and the first moment of consciousness upon awakening. It is a commonly reported phenomenon in the perioperative period, just like dreaming during natural sleep. It has also been reported that general anesthesia with propofol often results in dreams with positive content, which influences emotions after awakening. However, the details of when and under what conditions the brain undergoes dreaming experiences during anesthesia remain poorly understood. In addition, the homology between dreaming under anesthesia and spontaneous sleep is yet to be uncovered. Herein, we aimed to investigate the relationship between EEG and dreaming experiences under general anesthesia.
Methods: All participants underwent surgery under general anesthesia with propofol at Stanford University Hospital between 2021 and 2022. Standard ASA monitors and Sedline EEG electrodes at the frontal area were recorded during surgery, and the presence and content of dreaming experiences were interviewed immediately after awakening from anesthesia. The data from thirty-four patients (52.5±15.9 yrs.) who reported

dreaming and twenty-eight patients (48.8±13.4 yrs.) who did not report dreaming after emergence from anesthesia were analyzed. Time-frequency analysis was performed on EEGs, and parameters between dreamers and non-dreamers were compared.
Results: The pre-emergence state from the steady state of anesthesia to extubation was significantly longer in the Dreamer group (17.1±9.3 min vs. 9.1±8.6 min, d=0.8, p=0.01). During the pre-emergence state, a sharp decrease in frontal alpha-power and a sharp increase in Beta/Gamma power were observed.
Conclusion: The results suggest that dreaming occurs in the pre-emergence state between deep anesthesia and awakening. The finding that this state is characterized by a reduction in frontal alpha oscillation, which is considered to reflect the activity of the thalamocortical loop, provides insight into the neural basis of dreaming, nightmares, and consciousness.
Support (if any):

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0934

SELF-COMPASSION, BEDTIME PROCRASTINATION, SLEEP, AND MENTAL HEALTH IN INDIVIDUALS EXPOSED TO TRAUMA

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Introduction: Though it is increasingly evident that bedtime procrastination (delaying going to bed after one's intended bedtime) significantly interferes with health-promoting sleep, effects of bedtime procrastination have scarcely been studied in relation to trauma. Because sleep can be persistently problematic following trauma, even after completion of trauma-focused therapies, understanding and intervening with relevant malleable factors might improve trauma survivors' sleep and mental health. Although adherence to sleep hygiene practices has long been indicated for insomnia and downstream psychological effects, accumulating research is suggesting that sleep behaviors and other health behaviors can be further improved through self-compassion practice amidst personal shortcomings, struggles, and failures. Self-compassion can be conceptualized as an orientation toward increased awareness and acceptance of one's experiences—positive or negative, extending self-kindness during times of suffering, and feeling connection with the common human experience of life challenges. Functionally, self-compassion may promote effective self-regulation and curb emotional or behavior dysregulation, such as impulsivity or procrastination.
Methods: In this presentation, we discuss our cross-sectional and intervention studies (2 completed, 2 ongoing; respective N's = 25, 74, 235+, collecting) examining circadian rhythm and psychological factors linked to bedtime procrastination and potential mechanisms of reducing bedtime procrastination, improving sleep, and reducing PTSD symptom severity, such as emotion regulation and procrastinatory cognition. We review promising effects of a brief virtual group psychosocial intervention focusing on self-compassion and expanded sleep hygiene on bedtime procrastination, sleep, and mental health, and we describe how this intervention has been tailored to address the common daily and nightly experiences of trauma-exposed individuals (e.g., nightmares). Correlation analysis as well as moderation and mediation analyses are presented.
Results: Our findings with trauma survivors indicate that the relation between self-compassion and healthier sleep can be mediated through bedtime procrastination and sleep self-efficacy, one's belief that they can get healthy sleep. Further, we have found that the positive association between self-compassion and sleep self-efficacy is strengthened by sleep hygiene adherence.
Conclusion: In sum, bedtime procrastination appears salient to the sleep, emotional health and well-being of trauma-exposed individuals, and it can be reduced through intervention. Limitations, future directions for research, and scalable intervention development will be discussed.
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0935

SLEEP DISTURBANCES CORRELATE SIGNIFICANTLY WITH PTSD AND EMOTIONAL EXHAUSTION IN HUMANITARIAN AID WORKERS

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Introduction: International humanitarian aid workers (iHAWs) are professionals often exposed to considerable stress and trauma while delivering humanitarian support to populations in distress. Many studies support the deleterious association between sleep disturbances, alcohol use, posttraumatic stress symptoms (PTSS), and emotional exhaustion (EE). Considering the lack of research on this topic among iHAWs, we conducted an exploratory study to examine relationships among the aforementioned variables in iHAWs.
Methods: One hundred participants reflected on their on-mission experiences retrospectively while completing the Pittsburgh Sleep Quality Index (PSQI), the PSQI addendum for PTSD (PSQI-A), Posttraumatic Stress Disorder Checklist for DSM-5 (PCL-5), the Maslach Burnout Inventory (MBI), and the quantity-frequency measure for alcohol. Questionnaire completion rates ranged from 33% to 55%. Stepwise regression models were used to analyze the association between two outcome variables, PCL-5 daytime symptoms and EE measured by the MBI, and predictor variables, alcohol use, and PSQI global, and PSQI-A scores. Spearman regressions were used to examine the association between aid worker career length and PSQI global score. False Discovery Rate was adopted to adjust for alpha inflation.
Results: Stepwise regression analyses indicated a significant association between PCL-5 daytime symptoms and PSQI global score after accounting for alcohol use ($\Delta R2 = 0.139$, $p = 0.039$). Furthermore, PCL-5 daytime symptoms were significantly correlated with PSQI-A score after controlling for PSQI global score and alcohol use ($\Delta R2 = 0.320$, $p < 0.000$). Additionally, EE was significantly correlated with PSQI after accounting for alcohol use ($\Delta R2 = 0.140$, $p = 0.034$). Finally, based on Spearman regression, the aid-working career length was significantly associated with the PSQI component five, sleep disturbance ($\rho = 0.451$, $p = 0.003$).
Conclusion: Our results corroborate previous findings on the association between sleep disturbances, EE, and PTSS among populations such as first responders, medical professionals, and military personnel. Aid workers and their mental health could benefit from further attention among the research community, especially given the recent increase in conflicts worldwide. While the humanitarian community works on shifting mental health stigmas, sleep health optimization could be an interim step in encouraging iHAWs to seek care.
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0936

ASSOCIATIONS BETWEEN SLEEP, COGNITIVE FLEXIBILITY, AND ATTENTION IN TRAUMA-EXPOSED VETERANS

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Introduction: Post-traumatic stress disorder (PTSD) triggers disturbances in sleep such as prolonged sleep onset latency, decreased REM latency, higher amounts of REM sleep and lighter sleep. The impacts of these sleep difficulties on cognitive performance are clear. However, there is a limited understanding on how they may contribute to cognitive challenges that are affecting people living with PTSD. This study aimed to explore how attention and cognitive flexibility relate to sleep architecture in veterans with PTSD.
Methods: A group of thirty-six trauma-exposed veterans underwent psychiatric interviews, including the Clinician-Administered PTSD scale for DSM-5. Polysomnography was recorded on two nights: the first recording was used as an adaptation night and the second one was used for final analysis. On the morning following the experimental night, participants completed the Trail Making Test A and B, a task known to involve complex attention, visuospatial processing, working memory, and psychomotor coordination.
Results: Slower performance on the Trail Making Test A (i.e., attentional component of the task) correlated with longer sleep onset latency (r=.35, p=.037), higher amounts of light sleep (NREM1 and NREM2; r>.35, p<.037), and tended to correlate with longer REM sleep latency (r=.32, p=.056). In addition, non-significant trends suggested that higher number of errors committed on the Trail Making Test A were associated with longer sleep onset latency and higher amounts of NREM1 sleep (r=.30, p=.070). Slower performance on the Trail Making Test B (i.e., cognitive flexibility component of the task) tended to correlate with longer REM sleep latency (r=.33, p=.051) and lower sleep efficiency (r=-.31, p=.065).
Conclusion: These preliminary findings display some of the common abnormalities seen in people living with PTSD and how they relate to the severity of the cognitive challenges they are facing. Recognizing the active role of sleep for attentional processes and cognitive flexibility stresses the relevance of exploring whether sleep restoration may mitigate some of the debilitating symptoms of PTSD on cognition.
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0937

DEVELOPMENT OF THE AFFECTIVE NEUROSCIENCE DREAM RATING SCALE

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Introduction: Methods for quantifying emotional dream content have been developed. These approaches have yielded significant insights into dream content, their relation to waking cognition, and mental health. The current dream rating scale was developed to improve upon previous approaches by conceptualizing the scale based on the known fundamental affective neuronal circuits within the brain.
Methods: Seventy-seven items were developed representing fundamental emotions (SEEKING, RAGE, FEAR, LUST, CARE, GRIEF and PLAY). One-hundred dreams were randomly selected from a dream database (www.dream-bank.net). To determine interrater agreement, two raters scored all 77-items for each of the 100 dreams based on if the emotional content was present or not. Items with an interrater agreement (kappa) below .5 were excluded. Nightmares (i.e., extremely unpleasant or disturbing dreams) were independently identified by a sleep-trauma expert and compared to non-nightmares for the 7 scales.
Results: Thirty-three items (kappa > 0.5; range .5-.82) were retained for the final scale. Of the items retained, 29 (85%) were endorsed in 10% or more of dreams. The most frequently identified items in the final scale were danger (44%) and fear (45%). Seven emotional dream scales were apriori identified with 3-9 items each being retained in the final scales. Scales were significantly correlated between raters (r = .54 to .88, p< .001). Across the 100 dreams FEAR was the highest endorsed emotion scale while GRIEF was lowest. As expected, nightmares had significantly elevated scores compared to non-nightmares on the FEAR, RAGE, SEEKING and GRIEF scales (p< .001) but not CARE, LUST, or PLAY.
Conclusion: This dream rating scale based on mammalian emotional circuits previously identified through affective neuroscience shows promise for quantifying and understanding the emotional content of dreams. Future studies will need to further validate this preliminary affective dream content scale using different populations including individuals exposed to trauma and those with mental health and sleep disorders to determine its clinical utility.
Support (if any): N/A

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0938

EXPLORING NIGHTMARES AMONG US VETERANS, IMPLICATIONS OF DEPRESSION AND ANTIDEPRESSANTS

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Introduction: Nightmares are a frequent concern among US veterans, often linked to prevalent mental health conditions like depression and PTSD. Antidepressant medications are commonly used to manage these conditions, yet the association between their usage and the frequency of nightmares remains unclear.

Methods: The sample consisted of veterans at risk for sleep apnea at the Miami VA Sleep Center evaluated over one year. Veterans underwent home polysomnography (PSG) and completed questionnaires including demographics and the Munich Parasomnia Screening (MUPS). The frequency of nightmares was assessed using the nightmare item in MUPS. Electronic Medical Records were reviewed to obtain active medical and psychiatric diagnoses and active medication orders (including most common antidepressants: SSRIs, SNRIs, mirtazapine and bupropion) contemporaneous with the sleep evaluation.
Results: The study involved 649 veterans, predominantly male (84%) with mean age of 50 ± 14 years. Within this cohort, 49% were diagnosed with depression and 33% with PTSD. Regarding reported nightmare frequency, 16% indicated nightmares "never", 9% "less than once a year", 22% "once or several times a year", 22% "once or several times a month", 21% "once or several times a week" and 8% "almost every night." Multiple regression was used to predict nightmares. In model 1, depression was positively associated with nightmares (p=0.001), independent of PTSD and AHI. In model 2, using an antidepressant versus not was positively associated with nightmares (p=0.05). However, depression was no longer significant (p=0.102). In model 3, type of antidepressants was evaluated, but only SSRIs were significant (p=0.04) while depression remained non-significant.
Conclusion: The findings highlight the prevalence of nightmares among veterans. Although depression was initially associated with increased nightmare frequency, when treatment for depression was considered, depression no longer predicted nightmares. Instead, antidepressants and specifically SSRIs predicted nightmares. Considering the type of antidepressant may be crucial when patients report nightmares. Further research is needed to investigate the impact of mental health conditions and medication effects on nightmares in this population.
Support (if any):

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0939

EXPOSURE TO NEIGHBORHOOD VIOLENCE AND SLEEP-RELATED FEARS PREDICTS PTSD SYMPTOMS AMONG COMMUNITY-DWELLING ADULTS

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Introduction: Living in neighborhoods with high levels of stress can have a profound impact on an individual's sleep quality and mental health. Both chronic insufficient sleep and posttraumatic stress disorder (PTSD) have been linked to a variety of adverse health outcomes. Data indicates that PTSD interferes with sleep in part due to its relationship with sleep-related fears. However, limited research has investigated the contribution of neighborhood stress and sleep-related fears experienced within an individual's sleep environment. This study aimed to explore associations among exposure to neighborhood violence, sleep-related fears, and PTSD symptomatology.
Methods: Baseline data were obtained from participants who completed self-report measures as part of a larger study (N=45; Mean age=35.04 (SD=12.95); 62.2% Females). The Fear of Sleep Inventory (FoSI) assessed for past-month sleep-related fears within the sleep environment. The City Stress Inventory (CSI) assessed for exposure to neighborhood violence in the past year, and the PTSD-Checklist-5 (PCL-5) evaluated current PTSD symptom severity. A linear regression model identified the relationships between exposure to violence and sleep-related fears on PTSD symptoms.
Results: Data showed positive associations between exposure to neighborhood violence and sleep-related fears (r=.298, p=.047). There were also significant correlations between PTSD symptoms and violence exposure (r=.396, p=.007) and sleep-related fears (r=.613, p<.001), respectively. A linear regression model indicated that exposure to violence and sleep-related fears were significant predictors of PTSD symptoms (R2=.426, p<.001). Regression coefficients suggested that sleep-related fears (β=.543, p<.001) were a stronger predictor of PTSD symptoms than exposure to violence (β=.234, p=.062).
Conclusion: There results indicate that living in an environment characterized by higher exposure to violence may lead to greater fear of going to sleep, likely due to perceived increases in vulnerability during sleep. The results, although cross-sectional, also suggest that greater fear of sleep is predictive of worse PTSD symptomatology. Based on study findings, sleep health screenings may be useful for those individuals experiencing trauma-related stress.
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0940

FRONTAL ATTENTIONAL PROCESSES CORRELATE WITH SLEEP PROBLEMS IN VETERANS WITH POST TRAUMATIC STRESS DISORDER

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Introduction: Post-traumatic stress disorder (PTSD) instigates a series of neurocognitive dysfunctions, with sleep irregularities and attentional difficulties being key interacting features. Despite the known impact of sleep problems on cognitive performance, there is limited understanding about how poor sleep may be associated with basic attentional processes in individuals with PTSD. This study investigated associations between sleep macroachitecture and brain responses to attention processing involving the frontal cortex in veterans living with PTSD.
Methods: Event-related potentials were recorded before bedtime under two conditions: 1) presentation of an auditory stimulus at a rapid pace (every 2 seconds) and 2) the same auditory stimulus presented at a slower pace (every 16 seconds). Event-related potentials elicited in the slow condition are recognized for activating attentional networks in the frontal lobe, while event-related potentials elicited in the fast condition would activate the auditory cortex. Polysomnography was recorded throughout the night for sleep architecture. Associations between sleep architecture parameters and the N1 and P2 event-related potential components were assessed using Pearson correlations.

Results: Thirteen veterans (1 female, Mean+SD = 49 + 8.9 y.o.) with a PTSD diagnosis based on DSM-V criteria participated in this study. Most participants were using serotonergic medications. The P2 elicited in the slow condition was significantly negatively correlated with REM latency (r=-0.69, p=.008) and positively correlated with minutes spent in REM (r=0.59, p=.033). No other significant correlations were found.
Conclusion: Veterans living with PTSD often experience increased REM pressure, as reflected by shorter REM latency and higher amounts of REM sleep. This study highlights an association between REM abnormalities with increased brain resources mobilized by frontal attentional processing. Investigating how sleep interventions may influence attentional processes may help improve our understanding of how good sleep could counteract the adverse effects of PTSD on brain functions.
Support (if any): This project was funded by a competitive grant from the Canadian National Defence (Innovation for Defence Excellence and Security (IDEaS)).

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0941

LIMB MOVEMENTS IN SLEEP [LMS] AND PTSD-RELATED PHYSICAL SYMPTOMS: PRELIMINARY OBSERVATIONS

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Introduction: Periodic Limb Movements in Sleep [PLMS] can be present in over 60% of Posttraumatic Stress Disorder [PTSD] patients versus about 10% in the general population. PTSD is often associated with physical complaints. In the general population PLMS can be associated with physical symptoms . To my knowledge the association of PLMS and physical complaints in PTSD has not been reported.
Methods: 106 PTSD patients [all from MAG's practice] completed a battery of instruments. 44/106 patients (mean age+/-SD = 47.04+/-13.27 years; 89.6% female) met the inclusion criteria (no current use of benzodiazepines or narcotics; ability to have LMS ratings completed by bed partner). All participants met the DSM-5 criteria for moderate-to-severe PTSD during their initial consultation, with a Clinician Administered PTSD Scale for DSM-5 (CAPS-5) score of at least 55. The PTSD Checklist for DSM-5 (PCL-5) was used to obtain an index of the current PTSD severity (mean = 37.41, SD = 19.84; PCL-5 > 30 cut-off for PTSD). Limb Movements in Sleep [LMS] were considered a proxy for PLMS [ICSD3, 2014] and were measured using Item 10c of the Pittsburgh Sleep Quality Index [PSQI] [Buysse DJ,1989] where the patients' bed partner rated the patients' severity of "Legs twitching or jerking while they slept"; Low-LMS frequency included "< one time per week" or "not during the past month" and High-LMS frequency included " once or twice a week " and " three or more times a week".Physical symptoms were rated using the Pennebaker Inventory of Limbic Languidness [PILL][Pennebaker JW,1982] which rates 54 physical symptoms using the following scale: 1=Have never or almost never experienced the symptom; 2=Less than 3 or 4 times per year; 3=Every month or so; 4=Every week or so; and 5=More than once every week.
Results: The mean scores of 20/54 PILL items were significantly [p< 0.05] lower between the Low- versus High-LMS groups. The total 54 item mean PILL score was significantly [p=0.002] greater in the PTSD group with High-LMS [PILL score of 105] versus the Low-LMS scores [PILL score of 73].
Conclusion: PTSD patients with more frequent limb movements during sleep had greater daytime physical complaints.
Support (if any): None

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0942

THE MEDIATING ROLE OF EMOTIONAL AND BEHAVIORAL PROBLEMS BETWEEN NIGHTMARES AND SUICIDALITY IN ADOLESCENTS

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Introduction: Adolescence is a transitional period that is susceptible to sleep and mental health problem. Previous research has shown that sleep problems, including both insomnia and nightmares, as well as emotional and behavioral problems, are respectively associated with the suicidal risk. However, it remained unclear whether nightmares play an independent role in this link. The present study aimed to examine the association between nightmares and suicidality, and the potential mediating role of emotional and behavioral problems in this relationship in a community-based sample of Hong Kong Chinese adolescents.
Methods: A total of 2475 adolescents (12–20 years; mean age 14.8 ± 1.8 years; female: 63.80%) were recruited from the local secondary schools in Hong Kong. Participants completed a battery of self-report questionnaires: nightmares were measured using a single item in the Pittsburgh Sleep Quality Index (PSQI); suicidality was measured by the suicidality item in the Patient Health Questionnaire (PHQ-9); emotional and behavioral problems were measured by the Strengths and Difficulties Questionnaire (SDQ); and insomnia severity was measured by Insomnia Severity Index (ISI). Frequent nightmares were defined as having nightmares at least once per week. Suicidality was defined by the presence of suicidal ideation over the past two weeks.
Results: 45.4% of the participants reported having frequent nightmares, and 29.4% of the participants reported suicidal ideation over the past two weeks. Frequent nightmares (OR =1.53, 95% CI: 1.36 - 1.71), insomnia (OR = 1.13, 95% CI: 1.10 - 1.15) and emotional and behavioral problems (OR = 1.04, 95% CI: 1.03 - 1.05), age (OR = 0.93, 95% CI: 0.88- 0.98) were all found to be significantly associated with suicidality. Path analyses revealed that emotional and behavioral problems partially mediated the relationship between frequent nightmares and suicidality among adolescents (b = .03, 95% CI = .016, .051). The meditation effect remained significant after controlling age, gender, and insomnia severity.
Conclusion: Psychopathology mediates the relationship between nightmares and suicidality independent of the severity of insomnia. Nightmare disturbance and psychopathology should be taken into account in suicide prevention among adolescents. Future exploration on the mechanism underlying the link between nightmares and suicidality is needed.
Support (if any):

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0943

BIDIRECTIONAL RELATIONSHIPS BETWEEN DAILY SLEEP AND DEPRESSION: HOW DOES SHIFTWORK AND SLEEP VARIABILITY FACTOR IN?

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Introduction: Prior research has established that sleep disturbances and depression are associated. However, notable limitations exist across past studies, including the heavy use of between-person analyses that are often based on single time point measures, use of general "sleep disturbance" over well-defined facets of sleep, overreliance on self-reported sleep, and lack of attention to within-person effects and their interactions with group-level characteristics (e.g., shiftwork). To address these limitations, the current study examined relationships between daily sleep facets and depression in nurses across measurements (self-report, actigraphy) and moderators (shiftwork, intraindividual variability of sleep midpoint).
Methods: Participants were 349 nurses (90.83% female; 76.50% White; 89.20% non-Latinx; Mage = 39.13 years) who wore an Actiwatch and completed the Consensus Sleep Diary and Patient Health Questionnaire-2 for 14 days. Multilevel models examined the bidirectional associations between daily depression and sleep (i.e., sleep efficiency [SE], quality [SQ], duration, midpoint) across self-report and actigraphy measures. Shiftwork (day vs. night shift worker) and intraindividual standard deviation (iSD) of sleep midpoint were included as moderators in models.
Results: Daily depression and subjective SQ and SE were bidirectionally associated after covarying for gender, age, race, and ethnicity. On days when nurses experienced higher depression than their average, they experienced worse subjective SQ (b = -0.10, SE = 0.02, p < .001) and SE (b = -0.47, SE = 0.18, p = .008) on the same day. In turn, when nurses experienced worse subjective SQ (b = -0.07, SE = 0.02, p < .001) and SE (b = -0.01, SE = 0.00, p = .012) than their average, they experienced higher depression on the next day. Daily actigraphy-based sleep facets were not significantly associated with depression. Neither shiftwork nor iSD of sleep midpoint were significant moderators.
Conclusion: Results reveal bidirectional, daily associations between subjective, but not actigraphy-based, sleep and depression. This suggests one's perception of sleep may be more influential on and impacted by depression than how one more objectively slept. Intensive longitudinal approaches to understanding sleep and depression should continue to be utilized to allow for the establishment of temporal precedence and bidirectionality across granular time scales.
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0944

NATIONAL SLEEP FOUNDATION'S 2024 SLEEP IN AMERICA POLL: SLEEP HEALTH AND DEPRESSIVE SYMPTOMS IN TEENAGERS

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Introduction: A mental health crisis has been recognized among US teenagers, highlighted by high rates of mood disturbances. While a well-documented connection exists between sleep and mood, evidence largely comes from convenience samples of adults. Much less is known about the link between sleep and mental health in teenagers and even less is known about this important connection among the general teenage population. The overarching goal of the present study was to examine the associations among sleep health and depressive symptoms in teenagers.
Methods: A random sample of 1,124 US teenagers aged 13 to 17 years were recruited to complete surveys online in English or Spanish, including the Sleep Health Index, the Sleep Satisfaction Tool, and the Patient Health Questionnaire-9 for adolescents, a commonly employed screening tool assessing the presence and frequency of depressive symptoms in adolescents. Data were weighted via iterative proportional fitting to approximate population distributions. Analyses included both z-tests and t-tests to examine depressive symptom differences between individuals with varying levels of sleep health. Results have a margin of sampling error of plus or minus 4.1 percentage points.
Results: Thirty-seven percent of 13- to 17-year-olds reported symptoms consistent with at least mild levels of depression and just 8 percent of teens reported achieving nightly sleep durations recommended by the National Sleep Foundation (i.e., 8-10 hours). Teens with minimal or no depressive symptoms reported significantly more weekday sleep (7.4 hours) compared to those with mild (7.0 hours) and moderate-to-severe depressive symptoms (6.6 hours; p's<.05). Teens who were dissatisfied with their sleep were 22 percentage points more apt than sleep-satisfied teens to report moderate-to-severe depressive symptoms (27 vs. 5 percent, p<.05). Seventy-three percent of teens reported their emotional well-being was negatively impacted when they slept less than usual.
Conclusion: Sleep health and mental health are strongly linked in teens. When considering avenues to curb the teen mental health crisis, sleep health education should be a priority. Public health campaigns aimed at improving sleep health in teens should include efforts to start school later, reduce nighttime electronic use, and encourage family prioritization of sleep health.
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0945

SLEEP HEALTH AND SUICIDE IDEATION IN THE US: DATA FROM THE NATIONAL SLEEP FOUNDATION SLEEP IN AMERICA POLL

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Introduction: Previous studies have shown that poor sleep is generally associated with suicide ideation. But few studies have examined this relationship in the general population across many dimensions of sleep health, and it is not clear which sleep variables are most salient.
Methods: Data were collected as part of the National Sleep Foundation Sleep In America Poll. The population-based sample (N=1,042) provided data on a range of sleep questions, as well as each item of the PHQ9 depression scale. For the present analyses, PHQ item 9 (suicide ideation) was examined as a binary outcome, with population-weighted regression analyses adjusted for age, sex, race/ethnicity, education, income, and PHQ2 depression score. Independent variables included sleep satisfaction, feeling refreshed, daytime energy, difficulty falling asleep, frequent nighttime awakenings, difficulty resuming sleep, satisfaction with weekday and weekend sleep duration, ability to feel relaxed, overall sleep quality, weekday and weekend bedtime, waketime, time in bed, sleep duration, perceived sleep need,

and days/week (0-7) of: feeling well-rested, having trouble falling or staying asleep, sleep impacts functioning, daytime sleepiness, and sleep medication use. Bonferonni correction (0.05/26) was used.
Results: Population-weighted analyses adjusted for age, sex, race/ethnicity, education, income, and PHQ2 depression score showed that elevated likelihood of suicide ideation was associated (all p< 0.0019) with days/week: feeling well rested (OR=0.80/day), trouble falling asleep (OR=1.26/day), trouble staying asleep (OR=1.18/day), and sleep impacts functioning (OR=1.46/day). Weekday sleep duration (OR=0.73/hr), weekend sleep duration (OR=0.75/hr), "Very Dissatisfied" with sleep (OR=6.92), "Not energized at all" (OR=7.46), "A great deal" of trouble falling asleep (OR=6.91), "Very often" waking during the night (OR=5.75), "Very dissatisfied" with weekday (OR=6.95) and weekend (OR=7.81) sleep duration, and "Very difficult" to relax before bed (OR=10.04) were also associated. Stepwise analyses revealed that the variables that explain the most unique variance are (in order) days/week that sleep impacts functioning (R-squared 0.089) and satisfaction with weekend sleep duration (R-squared 0.012).
Conclusion: Many indicators of sleep health were associated with suicide ideation, implicating sleep duration, quality, efficiency, and daytime effects of sleep. Efforts might ideally focus on the daytime impacts of sleep as well as nighttime experiences.
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0946

EXAMINING THE DIRECTIONAL EFFECTS OF INSOMNIA, ANXIETY, AND DEPRESSION SYMPTOMS: RESULTS FROM A LONGITUDINAL STUDY

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Introduction: Although there is evidence supporting high comorbidity rates among insomnia, anxiety, and depression, the temporal relationship among them is less clear. Prior research supports that the onset of depression is often preceded by symptoms of anxiety and insomnia, but the current study is the first to look at the temporal relationship among all three symptoms in an adult sample representative of the general population. Determining the temporal progression of these problems is important for prevention and intervention efforts, in that early treatment for insomnia and anxiety may reduce the risk of developing depression.
Methods: 2,666 adult participants (Mage = 47.0, 79.0% female, 84.1% white) were recruited for an online study on health, resulting in a nationally representative sample. Well-validated instruments were used to measure symptoms of depression (CES-D), anxiety (STAI), and insomnia (ISI). Data was collected via Qualtrics surveys administered online at two time points (i.e., baseline and follow-up), with assessments conducted twice daily for two weeks in the morning and evening. Auto-regressive cross-lagged models were used to provide the best representation for how these data were collected, and allowed for temporal ordering at every pathway by examining the longitudinal relationship between each variable.
Results: Auto-regressive cross-lagged models revealed an indirect effect of anxiety symptoms on depression symptoms through insomnia symptoms. Tests of indirect effect were performed in two ways, using both insomnia T1 and insomnia T2 to provide temporal ordering between all three variables. The indirect effect of anxiety T1 on depression T2 through insomnia T1 was significant ($\beta = 0.253$, $p < 0.001$). The indirect effect of anxiety T1 on depression T2 through insomnia T2 was also significant ($\beta = 0.265$, $p < 0.001$). The almost-identical values for the two tests of indirect effect provide support for the presence of the temporal relationship between these three variables.
Conclusion: Results support the theory that insomnia may be one mechanism by which individuals with anxiety are at greater risk for developing depression. This is the first study to empirically evaluate a model in which insomnia symptoms explain the indirect effect of anxiety symptoms on depression symptoms in adults.
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0947

SUVOREXANT IMPROVES SYMPTOMS OF OPIOID WITHDRAWAL AND DEPRESSIVE SYMPTOMS THROUGH CHANGES IN OSCILLATORY BAND-POWER

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Introduction: Opioid withdrawal exacerbates depressive symptoms and poor sleep. Previous findings demonstrate suvorexant's ameliorative effect on sleep disturbances during this period, but is unknown whether these changes also confer benefit for depressive or withdrawal symptoms. therefore, we aimed to examine the effects suvorexant oscillatory sleep-EEG power during inpatient opioid withdrawal, and to examine their association with withdrawal severity and depressive symptoms.
Methods: Participants with Opioid Use Disorder (N=38: age-range = 21-63years, 87% male, 45% white) underwent an 11-night withdrawal (3-night stabilization, 4-night buprenorphine taper, 3-night buprenorphine post-taper) and were randomly assigned to suvorexant (20mg [n=14] or 40mg [n=12]), or placebo [n=12], while ambulatory sleep-EEG data was collected. Linear mixed-effect models were used to test associations between sleep-EEG band power change, depressive symptoms, and withdrawal severity.
Results: Across the 11 night withdrawal period, reductions in oscillatory delta power were observed in all study groups, and increases in beta power (20mg: $\beta = 2.579$, pval = 0.009 | 40mg ($\beta = 5.265$, pval < 0.001) alpha power (20mg: $\beta = 158.304$, pval = 0.009 | 40mg: $\beta = 250.212$, pval = 0.001) and sigma power (20mg: $\beta = 48.97$, pval < 0.001 | 40mg: $\beta = 71.54$, pval < 0.001) were observed in the two suvorexant groups. During the four-night taper, decreases in delta power was associated with decreases in depression (20mg: β= -190.90, p = 0.99 | 40mg: β= -433.33, p = < 0.001 [*Bonferroni corrected]), and withdrawal severity (20mg: β= -215.55, p = 0.006* | 40mg: β= -192.64, p = < 0.001*), in both suvorexant groups and increases in sigma power were associated with decreases in withdrawal severity (20mg: β= -357.84, p = 0.004* | 40mg: β= -906.35, p = < 0.001*). Post-taper decreases in delta (20mg: β= -740.58, p = < 0.001* | 40mg: β= -662.23, p = < 0.001*) and sigma power (20mg only: β= -335.54, p = 0.023*) were associated with reduced depressive symptoms in the placebo group.

Conclusion: Results highlight a complex and nuanced relationship between sleep EEG power and symptoms of depression and withdrawal. Changes in oscillatory delta power may represent a mechanism influencing depressive symptoms and withdrawal.
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0948

SLEEP PROBLEMS AND MENTAL HEALTH IN BUS DRIVERS: A CROSS-SECTIONAL STUDY

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Introduction: Public transit bus drivers, crucial to urban mobility, face unique challenges such as irregular schedules and prolonged driving hours, making them vulnerable to sleep problems. Despite the acknowledged impact of sleep issues on mental health in the general population, there is limited research exploring the relationship between sleep problems and mental health outcomes within this special population. This cross-sectional study aims to investigate the prevalence of self-reported sleep problems among bus drivers, and to analyze the relationship between sleep problems and mental health.
Methods: Methods: A total of 551 bus drivers (99.8% male, mean age: 49.07 ± 5.23 years) participated in the study. They underwent assessments for risk of obstructive sleep apnea (OSA, using STOP-Bang), insomnia symptoms (Insomnia Severity Index, ISI), excessive daytime sleepiness (Epworth Sleepiness Scale, ESS), and mood symptoms (Hamilton Anxiety Rating Scale, HAM-A; Hamilton Depression Rating Scale, HAM-D). Linear regression models were used to examine the associations between sleep problems and mental health, while controlling for age, sex, and BMI.
Results: Results: Ninety-eight (18%) drivers were identified as at risk of OSA (defined as STOP-BANG score ≥ 3), 35 (6%) had insomnia (defined as ISI score ≥ 15) and 62 (11%) had excessive daytime sleepiness (defined as EDS score ≥ 10). After controlling for age, sex, and BMI, anxiety symptoms demonstrated positive associations with the risk of OSA (St. $\beta = 0.26$, $p < 0.001$), insomnia symptoms (St. $\beta = 0.52$, $p < 0.001$), and excessive daytime sleepiness (St. $\beta = 0.40$, $p < 0.001$). Furthermore, depressive symptoms were positively associated with insomnia symptoms (St. $\beta = 0.27$, $p < 0.001$) and excessive daytime sleepiness (St. $\beta = 0.01$, $p = 0.032$).
Conclusion: Conclusion: Among bus drivers, the prevalence of OSA, insomnia, and EDS is noteworthy. These symptoms are associated with exacerbated mood symptoms. Prompt treatment for sleep problems is crucial to alleviate these effects and enhance overall well-being.
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0949

SLEEP QUALITY AND SELF-PERCEIVED FLOURISHING IN LIFE

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Introduction: Sleep disruption has a significant effect on emotional wellbeing. Prior research suggests that poor sleep or insufficient sleep can impair mental health, emotional intelligence, mood, and life satisfaction. However, little is known about how sleep problems contribute to an individual's self-perceived success in critical areas of interpersonal relationships, purpose, optimism, and self-esteem. Here we examined the associations between sleep quality and self-perceived flourishing in life using the Flourishing Scale. It was hypothesized that better sleep quality would be associated with increased flourishing.
Methods: 125 healthy participants (86 female; age=24.1, SD=6.0 years) completed an online set of questionnaires about emotional skills and sleep. These included the Pittsburgh Sleep Quality Index (PSQI), which measures several dimensions of sleep disturbance, and the Diener et al. Flourishing Scale (FS), and 8-item scale that measures several dimensions of purpose/meaning and satisfaction with life, optimism, competence, and interpersonal relationships. Individual scales of the PSQI were correlated with the construct of Flourishing.
Results: FS was significantly correlated with Total PSQI ($r=-.42$, $p<.001$). Subscale analysis revealed that this association was driven by several facets of the PSQI, including subjective sleep quality ($r=.26$, $p=.003$), sleep latency ($r=-.35$, $p<.001$), sleep duration ($r=-.30$, $p<.001$), sleep efficiency ($r=-.18$, $p=.04$), sleep disturbances ($r=-.31$, $p<.001$), and daytime dysfunction ($r=-.47$, $p<.001$). Sleep medications were unrelated to FS.
Conclusion: Flourishing, the self-perceived success in managing life and relationships competently was associated with multiple facets of self-perceived sleep quality. While these findings are limited by the self-report nature of the study, they do suggest that interventions to address sleep quality could affect broader aspects of mental health and emotional functioning that contribute to living a richer and more satisfying life.
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0950

SOCIAL RHYTHM REGULARITY AND MOOD: TWO FORMS OF IMPULSIVITY WITH DIFFERENTIAL MODERATING EFFECTS

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Introduction: Circadian rhythm dysregulation can elicit maladaptive consequences, including mental and emotional health problems. The social zeitgeber model theorizes that irregular social rhythms can disrupt biological rhythms, which negatively impacts mood. This relationship is particularly apparent among individuals diagnosed with bipolar spectrum disorders (BSD), such that social rhythm disrupting life events can trigger episode onset. Impulsivity, a core feature of BSD, has also been shown to differentially effect mood symptom pathophysiology (hypo/mania vs. depression). This study examined whether two forms of impulsivity moderated the association between social rhythm regularity (SRR) and mood symptoms (hypo/mania vs. depression) in individuals at low-risk, high-risk, and diagnosed with BSD.
Methods: Adolescents and young adults (n = 490) were recruited based on levels of trait reward sensitivity and diagnostic

interviews. For this study, participants completed a self-report measure of attentional, motor, and non-planning impulsivity (Barratt Impulsiveness Scale [BIS]), and a behavioral task of reward-related impulsivity (the Balloon Analog Risk Task [BART]). Participants also completed measures of SRR, depressive, and hypo/manic symptoms. Models were estimated with SRR as the focal predictor and impulsivity as the moderator. Significant interactions were probed using simple slopes analyses.
Results: Both forms of impulsivity moderated SRR - mood symptoms relationship. BIS score moderated the association between SRR and hypo/manic symptoms, and simple slopes analyses revealed that only those low in impulsivity exhibited a positive association between SRR and hypo/manic symptoms. This finding was not obtained for the BART. BART score moderated the association between SRR and depressive symptoms, and simple slopes analyses found that only those who scored low in impulsivity exhibited a negative association between SRR and depression. This finding was not obtained with the BIS.
Conclusion: Individuals with low levels of impulsivity were most vulnerable to the effects of SRR on mood, although the polarity of the mood (hypo/mania versus depression) differed based on the impulsivity measure used (BIS versus BART). It is not clear whether the difference is due to self-report vs. behavioral measurement or to the differing forms of impulsivity assessed by the BIS vs. BART.
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0951

STRESS MEDIATES THE RELATIONSHIP BETWEEN DISCRIMINATION AND SLEEP IN MIDDLE EASTERN AND NORTH AFRICAN AMERICANS

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Introduction: Discrimination is clearly associated with a number of poor health outcomes and emerging research demonstrates the possibility of a similarly negative relationship with sleep. Stress is posited as a mediator of the discrimination-sleep link, but this has not been explored among Middle Eastern and North African Americans (MENA). The current study explores the mediating role of stress in the relationship between discrimination and two sleep outcomes (sleep-related impairment and sleep disturbance) among MENA.
Methods: This sample included 126 participants who completed online Qualtrics surveys through Prolific. Participants completed self-report measures of discrimination (Brief PEDQ-CV; Brondolo et al., 2005), stress (Perceived Stress Scale; Cohen et al., 1983) and sleep. The latter was measured using the well-validated PROMIS short form sleep-related impairment and sleep disturbance scales (Yu et al., 2012). Process Macro Model 4 (Hayes, 2012) was run to examine the mediating role of stress on discrimination and sleep outcomes. Generational status and sexual orientation were used as covariates, as they were significantly correlated to focal variables.
Results: Discrimination predicted stress (b =2.61, SE = 0.75, p < .01). Stress significantly both sleep-related impairment (b =0.67, SE = .08, p < .001) and sleep disturbance (b =0.55, SE = 0.10, p < .001). There was no direct effect of discrimination predicting sleep-related impairment (b =1.14, SE = 0.70, p =0.11) or sleep disturbance (b =0.98, SE = 0.85, p =0.25). However, there was a significant indirect effect of discrimination predicting sleep disturbance (b = 1.44; CI: 0.63-2.38) and sleep-related impairment (b = 1.75; CI: of 0.83-2.83) through stress as indicated by non-zero confidence intervals. These results indicate a full mediation effect of stress between discrimination and sleep-related impairment and discrimination and sleep disturbance.
Conclusion: Discrimination in MENA is associated with poor sleep through increased stress. These findings have implications for research and treatment in MENA. Immediate and short-term interventions for the effects of discrimination may include improving stress management to promote better sleep. Future research should continue to explore how to reduce discrimination and reduce its effects to promote sleep and overall health.
Support (if any):

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0952

SUBJECTIVE SLEEP IMPROVEMENTS FOLLOWING DAILY THETA-BURST STIMULATION FOR TREATMENT-RESISTANT DEPRESSION

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Introduction: Sleep disturbances are commonly observed in individuals with depression, and are associated with severity of depression, treatment outcomes, and risk of relapse. Repetitive transcranial magnetic stimulation, including newer optimized theta-burst stimulation (TBS) protocols, is recognized as a safe and effective intervention for treatment-resistant depression (TRD). Presently, little is known about the impact of TBS treatments on sleep in individuals with depression. We examined changes in subjective sleep and depression in individuals with TRD receiving daily TBS treatments, and the relationship between changes in these symptom domains.
Methods: 50 participants (50% female, mean age 46.82 years) with TRD received four or six weeks of daily TBS treatments targeting the left or bilateral dorsolateral prefrontal cortex while participating in a randomized, double-blind clinical trial. Sleep disturbances and depression severity were measured at baseline, session 20 and session 30 using the Leeds Sleep Evaluation Questionnaire and 17-item Hamilton Rating Scale for Depression (HRSD-17), respectively. Linear mixed models examined whether scores changed significantly throughout treatment. Spearman's correlations investigated whether changes in depression and sleep were associated.
Results: HRSD-17 scores improved significantly from baseline to weeks 4 and 6 ($p < 0.001$). We also observed significant improvements in quality of sleep (QOS), ease of awakening from sleep (AFS), and behaviour following wakefulness (BFW) after 4 and 6 weeks of TBS ($p < 0.001$). After 4 weeks of TBS, improvements in HRSD-17 significantly correlated with BFW scores ($p = 0.008$). After 6 weeks of TBS, improvements in HRSD-17 scores significantly correlated with improvements in both AFS and BFW scores ($p < 0.005$).
Conclusion: Participants reported improvements in depression, sleep quality, ease of waking, and daytime alertness following TBS. Furthermore, improvements in several aspects of sleep and

depression were correlated. These findings suggest that TBS may be an effective intervention for individuals experiencing comorbid depression and sleep disturbances. This also strengthens the view that sleep enhancement may contribute to better mental health outcomes.
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0953

THE INTERACTION BETWEEN INSOMNIA AND EXCESSIVE DAYTIME SLEEPINESS ON COGNITIVE AND SOMATIC DEPRESSIVE SYMPTOMS

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Introduction: Sleep and mental health are Healthy People 2030 Public Health priorities. Emerging adults experience a combination of biosocial and environmental changes that contribute to increased susceptibility to sleep disturbances and poor mental health during the college years. Excessive daytime sleepiness and insomnia represent distinct sleep disturbances, and both have been linked to depressive symptomatology. However, few studies have examined their interactions on specific mood symptoms. This study explored the moderating effect of excessive daytime sleepiness on the relationship between insomnia and cognitive and somatic depressive symptoms.
Methods: Emerging adults (N=104, Mean age=20.22± .78, 81.7% Female) completed self-report measures on sleep and depressive symptoms. The insomnia severity index assessed for the nature, severity, and impact of insomnia symptoms, with higher scores indicating greater symptom severity. Excessive daytime sleepiness was assessed using the Epworth sleepiness scale. The Beck depression inventory (BDI-II) assessed for the presence and intensity of overall depressive symptoms, with cognitive and somatic depressive symptoms derived from subscales. Higher scores represented greater depressive severity. All statistical analyses were conducted using IBM SPSS version 29, along with Hayes PROCESS macro for moderation analyses.
Results: Data showed a positive correlation between insomnia severity and excessive daytime sleepiness (r=.24, p=.01). We also found significant associations between insomnia severity and overall depressive symptoms (r=.52, p<.001), cognitive depressive symptoms (r=.42, p<.001) and somatic depressive symptoms (r=.58, p<.001). Findings indicated significant main effects of insomnia (b=.95 ±.24, p<.001) and excessive daytime sleepiness (b=.72 ±.31, p=.02) on cognitive depressive symptoms, and excessive daytime sleepiness significantly attenuated the association between insomnia and cognitive depressive symptoms (b=-.05 ±.02, p=.03). Results also indicated a significant main effect of insomnia, but not excessive daytime sleepiness (b=.05 ±.22, p=.81) on somatic depressive symptoms (b=.49 ±.17, p=.01). Additionally, there was no interaction between insomnia and excessive daytime sleepiness on somatic depressive symptoms (b=-.001 ±.02, p=.96).
Conclusion: Data indicates that sleep disturbances are risk factors that need to be considered and addressed when treating depressive symptoms among emerging adults.
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0954

ASSOCIATIONS BETWEEN SLEEP DURATION AND TIMING AND POSTPARTUM ANXIETY SYMPTOMS

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Introduction: Postpartum anxiety is understudied and underdiagnosed in postpartum women, despite being more common than postpartum depression. Given associations between postpartum anxiety and adverse maternal and infant outcomes, it is crucial to identify patterns and predictors of postpartum anxiety. We examined the associations between sleep duration and timing and postpartum anxiety over 6 months following delivery.
Methods: Pregnant women (n=147; 30-39 weeks) with a history of depression completed the Pittsburgh Sleep Quality Index (PSQI), Edinburgh Postnatal Depression Scale, and Generalized Anxiety Disorder Scale-7 monthly following delivery for 6 months. Sleep duration and timing were extracted from the PSQI. Sleep timing was calculated as the midpoint between sleep onset and offset. In a multilevel model, sleep duration and timing were person-mean centered at level 1 (month level) and grand-mean centered at level 2 (participant level). Level 1 included main effects of time, sleep duration and timing, and interactions between time and person-mean centered sleep duration and timing and time and grand-mean centered sleep duration and timing. Level 2 included main effects of sleep duration and timing. Depression symptoms were included as a covariate at both levels.
Results: The intraclass correlation for anxiety symptoms was .46, supporting the use of a multilevel model. Anxiety symptoms increased over time (p<.001). Months with shorter sleep duration were associated with higher concurrent anxiety symptoms (p<.001). The effect of sleep duration on anxiety symptoms varied over time, such that those with shorter sleep duration reported higher anxiety symptoms than those with longer sleep duration in early postpartum months, whereas anxiety symptoms increased during later postpartum months regardless of sleep duration. Sleep timing was not significantly associated with anxiety symptoms (p>.05).
Conclusion: Postpartum anxiety increased over time, suggesting such symptoms are not transient features of the immediate postpartum period and highlighting the need to identify predictors. Shorter sleep duration may signal risk for elevated postpartum anxiety on a monthly timescale, particularly during early postpartum months. Treatments aimed at promoting sleep to improve postpartum anxiety may be most effective if targeted at early postpartum months. Future research should replicate these findings with objective sleep measures.
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0955

CORRELATION BETWEEN CPAP USE AND SYMPTOMS OF DEPRESSION, ANXIETY, AND SLEEPINESS IN PATIENTS WITH OSA

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Introduction: Obstructive Sleep Apnea (OSA) is a prevalent sleep disorder associated with poor health outcomes, including sleepiness, anxiety, and depression. This study aimed to further explore this relationship by looking at outcomes after treatment of OSA with continuous positive airway pressure (CPAP) therapy, using the Patient Health Questionnaire (PHQ-9), Generalized Anxiety Disorder 7 (GAD-7), and Epworth Sleepiness Scale (ESS) questionnaires respectively.
Methods: An observational longitudinal study in which the PHQ-9, GAD7, and ESS questionnaires were administered to adult patients diagnosed with OSA during the initial consultation and after three months of CPAP use. All patients had a diagnosis of OSA by a sleep study. Data collected included demographics, PSG data, and questionnaire results. Patients without follow-up or incomplete data were not included.
Results: One hundred patients were initially recruited. Thirty-five patients have completed data after three months. The mean±SD age was 50.9±15.4, BMI 36.5±8.9, 54% male and 46% female. Women were older 61.1±14 than men 46.5±14.9, p< 0.001. The percent of CPAP adherence was 68.7±36.7, and hours used per day were 5.5±1.8. The PHQ-9 initially was 10.4±5.6 decreased to 5.32±5.3 p< 0.001. GAD-7 initially 6.4±6.2 decreased to 4.29±4.8 p< 0.001, ESS initially 11.1±5.5 decreased to 5.8±4.3 p< 0.001. Neither age, BMI, or AHI correlated with compliance or hours used. The strongest negative correlation was between post-treatment GAD-7 and compliance (r= -0.45), followed by a mild negative correlation between PHQ-9 and compliance (r = -0.345). A mild positive correlation existed between the initial ESS and the AHI (r = 0.288). There were no statistical differences in questionnaire results between men and women.
Conclusion: The study demonstrates that daytime symptoms of sleepiness, depression, and anxiety improved in a cohort of patients with OSA and CPAP. The post-CPAP GAD-7 was moderately and negatively correlated with CPAP compliance percent use, while PHQ-9 was mildly negatively correlated. Initial ESS was mildly correlated with AHI, and although it improved, it was not correlated with compliance.
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0956

DIURNAL VARIATION IN ANXIETY AND ACTIVITY IS INFLUENCED BY CHRONOTYPE AND PROBABLE ANXIETY-RELATED DISORDER STATUS

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Introduction: Anxiety symptoms can vary extensively within a given day. One factor that may influence these variations is chronotype. Evening chronotypes prefer to engage in activities (e.g., sleep, physical and social activity) later in the day and are more likely to suffer from anxiety-related disorders. We here wanted to determine how chronotype influences diurnal variation in anxiety symptoms and to what degree such effects are amplified in individuals with a probable anxiety-related disorder.
Methods: We examined the diurnal variation in anxiety symptoms and daily activities in morning and evening chronotypes with and without probable generalized anxiety disorder (GAD) and obsessive-compulsive disorder (OCD) in a community sample of adults (N=407; n=318 female, n=87 male, n=2 non-binary; Mage=32.1 ±8.9). Participants reported symptoms and activities during six diurnal sessions between ~08:00-00:00. Chronotype was measured by the reduced Morningness-Eveningness Questionnaire. Diurnal patterns of individual anxiety symptoms and activities and influence of probable GAD or OCD status and chronotype were tested by fitting generalized additive mixed effects models. Models were built with increasing complexity, including time of day, chronotype, and probable GAD/OCD and their interactions.
Results: Anxiety symptoms were higher in the evening and engagement in daily activities were lower in the morning in evening chronotypes (p's<.05), and these findings were most pronounced in those with probable GAD or OCD (p's<.05). Evening chronotypes with probable GAD or OCD reported worse anxiety symptoms in the evening and engaged less in daily activities in the morning and evening than their morning chronotype counterparts (p's<.05).
Conclusion: The highest levels of anxiety symptoms are experienced in the evening. The worst evening anxiety symptoms were reported in evening chronotypes, despite preferring this time of day. Personalized treatment approaches should consider that anxiety symptoms are typically highest in the evening and that this is particularly true in evening chronotypes with a high risk for having GAD or OCD.
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0957

MULTIDIMENSIONAL SLEEP HEALTH IS ASSOCIATED WITH AFFECTIVE INSTABILITY IN STROKE SURVIVORS

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Introduction: Affective instability, a form of emotion dysregulation, is defined by rapid and intense shifts in affect and a known precursor of affective disorders. Poor sleep health leads to emotional dysregulation and affective instability. Poor sleep health is common after stroke, but which specific aspects of sleep health are important is unclear. We hypothesized that a multidimensional assessment of sleep health would identify specific factors that contribute to affective instability in stroke survivors.
Methods: Forty community-dwelling stroke survivors underwent multidimensional sleep health assessment with sleep diaries, the Pittsburgh Sleep Quality Index and ecological momentary assessment of affect and alertness eight times daily for seven days. Sleep health was quantified into 6 domains of the Regularity, Satisfaction, Alertness, Timing, Efficiency, Duration (RU-SATED) framework. Affective instability was quantified using probability of acute change (PAC) and mean squared

successive difference (MSSD). Multivariable linear regressions were used to identify sleep health factors associated with affective instability, adjusting for age, sex, and race.
Results: Instability of depressed affect was associated with lower alertness (MSSD: B=.55, p=.001; PAC: B=.76, p<.001), lower sleep efficiency (B=.35, p=.036), and longer sleep latency (B=.38, p=0.30). Instability of cheerful affect was associated with less regular mid-sleep time (MSSD: B=.57, p<.001; PAC: B=.48, p=.004), less regular sleep duration (B=.43, p=.012), and longer sleep latency (MSSD: B=.39, p=.020; PAC: B=.39, p=.021).
Conclusion: Lower sleep efficiency, longer sleep latency, lower alertness, and irregular sleep contribute to affective instability among stroke survivors. Future intervention efforts managing these specific factors of sleep health to stabilize affective changes and prevent affective disorders after stroke are needed.
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0958

PRIOR NIGHT SELF-REPORT AND BEHAVIORALLY-ASSESSED SLEEP DURATION IS ASSOCIATED WITH THE PUPILLARY UNREST INDEX

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Introduction: Excessive daytime sleepiness is experienced by approximately 5-10% of adults and 20-30% of older adults (Young et al., 2004). However, assessment of sleepiness has posed challenges, specifically lack of agreement between different assessments. While the construct of sleepiness hinges on insufficiently sleep, different assessments of sleepiness may conflate fatigue, mood, or anhedonia. This study tested whether physiological (Pupillary unrest) and subjectively assessed sleepiness were associated with prior night sleep duration. Results may allow subjective reports of sleepiness to be clarified with the potential to intervene more effectively.
Methods: Participants included 95 never depressed control (M age=38, SD=12) and individuals diagnosed with seasonal depression (M age=39, SD=12). We administrated the pupil sleepiness test, while the EYE-TRAC (R) 6000 tracked pupil diameter at 60Hz. The PUI was quantified as the cumulative change in pupil diameter (mm) over 1 minute. The average PUI over the full 11-minute protocol was calculated. Self-reported sleep duration was calculated as the difference between bedtime and waketime the night prior to the PUI. Self-report sleepiness was assessed via the Epworth Sleepiness Scale the week of the PUI assessment. A subset of participants had actigraphically-assessed sleep (n=47). We used multi-level models to account for repeated measures in winter and summer and included PUI testing time, diagnostic group, season, age, and gender as covariates. PUI was log transformed to account for skewness.
Results: The PUI was inversely associated with both self-report (b=-0.03, p=0.01) and actigraphy sleep duration (b=-0.00, p=0.02). Conversely, subjective sleepiness was not associated with either self-report sleep duration (b=-0.00, p=0.16) or actigraphy calculated sleep duration (b=-0.02, p=0.31).
Conclusion: The current findings suggest the PUI is correlated with sleep duration the prior night, but subjective reports of sleepiness is not. This indicates that sleep duration may be a mechanism contributing to excessive physiological daytime sleepiness. Individuals reporting greater sleepiness may be actually experiencing fatigue, anhedonia, or depressed mood; overlapping but distinct constructs with unique etiological considerations. Future work should work to examine how different sleep parameters may be differentially related to sleepiness and fatigue constructs, and to determine if using the PUI to match intervention strategies is clinically advantageous.
Support (if any): NIH

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0959

SLEEP AND PHARMACOTHERAPY IN TREATMENT-RESISTANT LATE-LIFE DEPRESSION: FINDINGS FROM THE OPTIMUM CLINICAL TRIAL

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Introduction: Adults with treatment-resistant late-life depression (TRLLD) have high rates of sleep problems. However, little is known about the occurrence and change in sleep during pharmacotherapy of TRLLD or how sleep affects treatment response. We investigated the bidirectional relationship between sleep and treatment outcomes in the Optimizing Outcomes of Treatment-Resistant Depression in Older Adults (OPTIMUM) study, the largest comparative effectiveness trial of pharmacotherapy for TRLLD to date.
Methods: This analysis examined: (1) occurrence of reduced sleep in 634 participants in the OPTIMUM randomized controlled trial; (2) how their sleep changed during pharmacotherapy; and (3) whether treatment outcomes differed among participants with consistent insufficient sleep [n = 164], worsened sleep [n = 62], or with improved sleep [n = 158]). We used item #4 (scale 0 – 6) from the Montgomery-Asberg Depression Rating Scale (MADRS) to assess insufficient sleep, representing reduced sleep duration or depth compared to usual sleep pattern. Scores >2 indicate a meaningful reduction in duration or sleep depth. Patients who scored >2 on item #4 throughout the trial were classified as having consistent insufficient sleep; patients who reported an increased score (and >2 at trial end) were classified as having worsened sleep; and patients who reported a decreased scores (and ≤2 at trial end) were classified as having improved sleep. Treatment response was defined as a > 50% reduction in the total MADRS score (minus item #4) at trial end.
Results: About half (51%, n= 323) of participants with TRLLD reported reduced or insufficient sleep before treatment. At trial end, consistent insufficient sleep and worsened sleep were each associated with treatment non-response. Improve sleep was not a significant predictor of treatment response, however participants with consistent sufficient sleep or improved sleep were three times more likely to experience treatment response compared to patients with insufficient sleep and worsened sleep.
Conclusion: Insufficient or reduced sleep are modifiable factors that may improve treatment outcomes in TRLLD. Given that sleep complaints including insomnia are associated with greater risk of depressive relapse and treatment non-response, a tailored treatment plan for those at greatest risk of sleep disturbance with concomitant depression may facilitate better outcomes.
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0960

UNRAVELING SLEEP EEG-ECG INTERACTIONS IN MAJOR DEPRESSION: PRELIMINARY RESULTS OF A COHERENCE ANALYSIS

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Introduction: In addition to common sleep disturbances, major depression involves intricate interactions between the cardiovascular and central nervous systems, underscoring the multidimensional nature of its pathophysiology. This study investigates how brain and heart activity interact across sleep states and brain topography in the context of depression.
Methods: Simultaneous sleep electrocardiograms (ECG) and electroencephalograms (EEG: F3, C3, and O1) were extracted from the polysomnograms of 50 individuals diagnosed with major depression and 50 controls. Following artifact removal, a coherence metric based on cross-power spectral density between the ECG and EEG was developed to characterize brain-heart connections in the 0.015-4 Hz delta and 4-8 Hz theta bands. Statistical analysis including bootstrapping, t-tests, analysis of variance, and multiple comparison tests were utilized to identify significant differences in brain-heart coherence between the depressed and healthy groups.
Results: Preliminary results show that, in NREM sleep within the theta band, individuals with depression showed significantly higher mean of ECG-EEG coherence values (MCV) compared to healthy controls across all EEG channels. MCVs for the depression and control group respectively were: 0.576±0.014 vs. 0.563±0.014 in F3, 0.545 ± 0.006 vs. 0.540±0.008 in C3, and 0.574±0.014 vs. 0.563±0.012 in O1 ($p< 0.0001$). No significant group difference was observed during REM sleep. Furthermore, irrespective of depression status, the MCV in O1 was significantly higher in NREM compared to REM sleep for the full spectrum between the delta and theta bands ($p< 0.00001$). In contrast, MCV in F3 and C3 did not significantly differ between NREM and REM sleep. In the delta band, regardless of depression status, the MCV was significantly lower in C3 compared to F3 and O1 during NREM sleep, but during REM sleep MCV was significantly higher in C3 than in O1 ($p< 0.0001$).
Conclusion: The higher brain-heart coherence linked to theta activity during NREM sleep we observed in people with depression may suggest stronger interactions between autonomic and cortical arousal. This could be one of the factors worsening sleep during depression. Beyond generating new insights about pathophysiological mechanisms underlying the high comorbidity between sleep, cardiovascular, and mental disorders, this may inform further work to identify multi-systemic biomarkers of depression.
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0961

ASSOCIATION OF SLEEP DISTURBANCE AND DEPRESSION WITH EFFORT-BASED DECISION MAKING AND DELAY DISCOUNTING IN VETERANS

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Introduction: Insomnia symptoms are associated with negative depression treatment outcomes including longer time to recovery, greater risk of depression relapse, and treatment nonresponse. A theoretical model has hypothesized that insomnia influences depression by impacting reward processes central to depression (e.g., effort-based decision making and delay discounting). The present study examined the cross-sectional relationships of insomnia and depression symptoms with behavioral measures of these constructs.
Methods: Eighty-nine veterans (Mage = 47.3, 60.2% male) with a range of insomnia and depression symptoms were administered the Hamilton Rating Scale for Depression (HRSD), the Insomnia Severity Index (ISI), and one week of sleep diaries and wrist actigraphy. Participants then completed a delay discounting task (DDT) along with two measures of effort-based decision making: the Effort Expenditure for Rewards Task (EEfRT) and the Progressive Ratio Task (PRT). Nine models were analyzed: linear regressions examined associations of insomnia (ISI and sleep efficiency from diaries and actigraphy) and depression jointly, with PRT and DDT outcomes; generalized estimating equations were conducted for EEfRT outcomes.
Results: Higher insomnia scores predicted greater delay discounting ($B = 0.065$, $p = .02$) while depression scores did not. Diary and actigraphy-measured sleep efficiency did not significantly predict delay discounting, however greater depression symptoms predicted greater delay discounting in those models (p's <.006). Higher insomnia scores predicted greater effort on the PRT ($B = 0.027$, $p = .01$) whereas lower depression scores predicted greater effort ($B = -.039$, $p <.001$). Sleep diary efficiency and depression were likewise significant ($p = .047$ and .011 respectively) but only depression was significant in actigraphy models. Neither depression nor insomnia significantly predicted EEfRT outcomes.
Conclusion: Although greater depression symptoms were associated with diminished effort on the PRT task and reduced willingness to wait for rewards, insomnia symptoms showed differential relationships to these processes. Insomnia symptoms may represent heightened arousal that, even in the context of depression symptoms, may contribute to difficulty with disengagement in certain reward-relevant tasks. Future research is needed to disentangle the relative contributions of insomnia and depression to reward-relevant behavior.
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0962

RECIPROCAL INTERACTIONS BETWEEN SLEEP AND MENTAL HEALTH: A STRUCTURAL EQUATION ANALYSIS IN A DIGITAL COHORT

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Introduction: New digital tools constitute an opportunity in understanding the interactions between sleep health and mental health. Structural equation analysis applied to these e-cohort

allows to study the bidirectional associations between these dimensions. Thus, we aimed to study the reciprocal interactions between behaviors (duration, temporality, regularity) and sleep health (insomnia and somnolence) and mental health (anxiety and depression).
Methods: Digital cohort of 3000 participants invited to complete weekly self-questionnaires over 17 days on their sleep health (Epworth and ISI), their mental health (PHQ-9 and PHQ-2) as well as sleep diaries which made it possible to calculate their sleep behaviors (duration, median, and regularity index). The interaction analysis used a longitudinal structure equation model.
Results: The average age of the participants was 51 years (68% women). The average sleep duration was 7h24, the median sleep time was 3h30 in the morning, the regularity index was 84/100. Among them, 57% reported insomnia (ISI≥15), 41% reported drowsiness (ESS≥11), 19% reported anxiety (PHQ-2≥3) and 18% reported depression (PHQ-9≥15). Sleep behaviors were associated with sleep health and mental health cross-sectionally. Longitudinal structural equation modeling shows bidirectional associations between sleep health behaviors and mental health.
Conclusion: The demonstration of these reciprocal interactions confirms the importance of the joint assessment and management of sleep and mental health behaviors and health in digital interventions aimed at modifying them. New interventional studies are awaited to confirm these results in the general population but also in subgroups of individuals at risk.
Support (if any):

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0963

AN INVESTIGATION OF SLEEP DISTURBANCE, DEPRESSION, AND ANXIETY AMONG EMERGING ADULTS

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Introduction: Sleep disturbances are highly comorbid with psychiatric disorders. Data indicates high comorbidity rates between insomnia and depression and anxiety disorders. However, limited data exist regarding whether sleep disturbance is an independent risk factor for or outcome of psychiatric disorders among emerging adults. This study explored relationships between insomnia, depression, and generalized anxiety.
Methods: Data were obtained from emerging adults (N=105; Mean age=20.28 (SD=1.9); 81% Female) who completed self-report measures. The Beck depression inventory (BDI-II) assessed for the presence and intensity of overall depressive symptoms. A cutoff score of greater than 20 was derived to determine probable depression. The Generalized Anxiety Disorder (GAD-7) scale assessed for severity and diagnosis of GAD. A cutoff score of 10 or greater was used to determine probable GAD. The Insomnia Severity Index assessed for the nature, severity, and impact of insomnia symptoms, with higher scores indicating greater symptom severity. All statistical analyses were conducted using IBM SPSS version 29.
Results: Approximately 36.2% of the sample had probable depression and 37.1% of the sample had probable generalized anxiety disorder. Data showed significant correlations between insomnia severity and probable depression (rpb=.316 p<.001) and generalized anxiety disorder (rpb=.449, p<.001), respectively. Linear regressions indicated that depressive symptoms (R2=.266, p<.001) and generalized anxiety symptoms (R2=.301, p<.001) were significant predictors for insomnia severity, respectively. Data also showed that insomnia severity significantly predicted depressive and generalized anxiety symptoms (R2=.355, p<.001), with insomnia being a stronger predictor for generalized anxiety symptoms (β=.374, p<.001) than depressive symptoms (β=.291, p=.004). Logistic regressions indicated that insomnia severity increased the odds of having both probable depression (X2=9.54, OR=1.14, p=.002) and generalized anxiety disorder (X2=17.30, OR=1.23, p<.001).
Conclusion: Findings suggest that insomnia severity is a risk factor for both depressive and generalized anxiety symptom severity and probable diagnoses. Data also indicated that depressive and generalized anxiety symptoms were independent risk factors for insomnia severity. Given the results, longitudinal studies are needed to understand whether there is a bidirectional relationship between sleep disturbance, depression, and generalized anxiety among emerging adults.
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0964

DEPRESSION MODERATES THE EFFECT OF REPETITIVE NEGATIVE THINKING ON SET-SHIFTING ABILITY IN YOUTH WITH INSOMNIA

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Introduction: Repetitive negative thinking (RNT), a perpetuating factor of insomnia, is often associated with adverse outcomes (e.g., depression). According to the Attentional scope model of rumination, RNT is associated with a narrowed attentional scope. As such, individuals with more RNT tend to exhibit stable attention toward task-relevant information. Previous research has also shown that RNT is linked to better set-shifting ability in adolescents. However, the evidence was mainly based on the research on mood disorders and remained limited and inconclusive in the context of insomnia. The study aimed to examine the relationship between set-shifting ability and RNT and explore the role of depression in this relationship among adolescents with insomnia.
Methods: Adolescents diagnosed with DSM-5 insomnia disorder were recruited. Participants completed self-reported questionnaires, including the Perseverative Thinking Questionnaire (PTQ) for the measure of RNT, the Insomnia Severity Index (ISI) and the Beck's Depression Inventory-Short Form (BDI-SF) and were administered Wisconsin Card Sorting Test (WCST). A score ≥ 10 on BDI-SF indicated the presence of depression. The number of Perseverative Responses (PR) and Perseverative Error (PE) on WCST were used to reflect set-shifting ability.
Results: Of 115 recruited participants with insomnia (Age: 18.34 ± 1.56, 14-20, female: 65.22%), the prevalence of depression was 51.30%. PTQ scores were significantly associated with PR and PE. The effect of PTQ on PR, but not PE, was moderated by the presence of depression. Among the participants with depression, lower PTQ scores were associated with greater PR, but such association was not observed in those without depression. Insomnia symptoms, presence of depression, age, and gender were not found to be associated with PR and PE, respectively.
Conclusion: RNT is associated with better performance in set-shifting among adolescents with insomnia. The result may

be explained by the attentional scope model, which suggests that RNT enhances the ability to ignore irrelevant information to the tasks, thus exerting greater set-shifting ability. Further exploration with neuroimaging is needed to understand the relationship between RNT and set-shifting ability in the context of insomnia and psychopathology.
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0965

INVESTIGATING CARDIAC AUTONOMIC ACTIVITY DURING SLEEP IN INDIVIDUALS WITH MAJOR DEPRESSION AND BIPOLAR DISORDER

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Introduction: Autonomic nervous system dysfunction and reduced heart rate variability (HRV) have been reported in individuals with mood disorders, a phenomenon likely to be influenced by sleep disturbances. Several studies have previously assessed HRV in individuals with major depression or bipolar disorder across the entire sleep period. This study investigated whether distinct heart rate (HR) and HRV profiles across wake, rapid eye movement (REM) sleep, and non-REM (NREM) sleep are linked to unipolar versus bipolar mood disorders in individuals with sleep complaints.
Methods: Polysomnographic data was retrospectively collated for 120 adult patients with sleep complaints and depressive symptoms referred to a specialized sleep clinic for sleep assessment [60 diagnosed with bipolar disorder (70% female, mean age= 43.4±11.6 years) and 60 age-matched cases diagnosed with a unipolar depressive disorder (68.3% female, mean age= 43.2±11.6 years)], and 60 age-matched healthy controls (68.3% female, mean age= 43.4±12.6 years). HR and time-based HRV parameters were computed on 30-second segments and averaged across the night for wake and sleep stages.
Results: Significant group by sleep stage interactions showed that the unipolar and bipolar groups had lower standard deviation of normal-to-normal intervals (SDNN) and vagal tone root mean square of successive R-R interval differences (RMSSD) compared to controls during NREM sleep (p≤.001) and REM sleep (p≤.003), but not during wake (p>.050). The unipolar group had significantly higher heart rate than controls regardless of sleep stages (all, p≤ .042), while the bipolar group had higher heart rate than controls only during NREM 2 (p=.012) and NREM 3 (p=.009) sleep. These interactions persisted after excluding individuals taking antipsychotic, lithium, anticonvulsant, and cardiovascular medications.
Conclusion: While additional research is required to account for manic and euthymic states, as well as the impact of psychotropic and cardiac medications, and potential confounders like variations in body mass index, the present findings suggest that the sleep-based autonomic signature of depressive states differs across different types of mood disorders and could potentially inform the development of biomarkers and therapeutic targets.
Support (if any): This project was supported by the Ottawa Region for Advanced Cardiovascular Research Excellence (ORACLE) funding program.

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0966

MOOD IN OSA PATIENTS WITH DIFFERENT CHRONOTYPES WITH AND WITHOUT CHRONIC PAIN

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Introduction: Mood has been related to chronotype, OSA and pain, although no studies have examined these three variables simultaneously. This study analyzes depression symptoms in relationship to self-reported sleep timing, PSG-determined AHI and the presence of chronic pain conditions (CPC) in patients referred for OSA evaluation.
Methods: From patients tested between 08/2017 and 04/2021, 360 (210 women) were selected based on self-reported sleep time criteria, no shift work, no significant cardiac, pulmonary, neurological, endocrine or psychiatric history except depression/anxiety; 78 had CPC (e.g., fibromyalgia, arthritis, sciatica, musculoskeletal pain and similar). Self-reported sleep times defined typical chronotype (TC, asleep 10pm-12am, wake-up 6-9am), early and late chronotypes (EC, LC, earlier or later than TC); those not clearly meeting these criteria or reporting < 6hr or >10hr of usual sleep were excluded. The Center for Epidemiologic Studies Depression Scale-Revised (CESDR) was an outcome; explanatory variables were AHI, chronotypes (EC, TC, LC), CPC; covariates were age, sex, BMI.
Results: EC (n=115), TC (n=163) and LC (n=82) were unrelated to CPC (chi-square=1.1, p=0.58). Older age (M=48.5±15.7) was predictive of lower CESDR (F=17.5, p< 0.001). AHI (M=14.6±21.0) was unrelated to CESDR (F=1.6, p=0.21) and did not interact with CPC or chronotypes. CPC presence predicted higher CESDR (F=8.1, p=0.004). Chronotypes predicted CESDR (F=7.8, p< 0.001) without significant interaction with CPC. LC/CPC-absent group had higher CESDR (M=20.7±18.9) relative to EC/CPC-absent (M=11.5±11.3, p< 0.001) and TC/CPC-absent (M=10.1±10.6, p< 0.001, Bonferroni post-hoc). Among CPC-present patients, CESDR did not significantly differ between EC (M=17.5±14.5), TC (M=16.3±10.3) and LC (M=22.9±17.3).
Conclusion: In this sample, there was no relationship between OSA and depression symptoms. In patients without CPC, late self-reported sleep time was associated with higher depression symptoms, relative to early and typical sleep times. However, in patients with CPC, CESDR scores did not reach significant difference between chronotypes, apparently due to the overall elevation of depression symptoms in these patients.
Support (if any): none

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0967

NETWORK ANALYSIS OF DEPRESSION AND INSOMNIA AMONG PREGNANT WOMEN

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Introduction: Pregnancy is a vulnerable period of lifespan characterized by a myriad of physiological and psychological changes and challenges. Whilst the existing research has documented the intricate relationship between insomnia and depression among expectant mothers, the use of sum scores of the measures in previous studies might have limited the understanding of the underlying mechanisms and key symptoms contributing to the development and persistence of these conditions. The current study aimed to examine the inter-relationship between the symptoms of insomnia and depression during the antenatal period using a networking approach.
Methods: A total of 480 pregnant women were recruited from the outpatient clinics of local hospitals and the community in Hong Kong. Insomnia and depressive symptoms were assessed by the Insomnia Severity Index (ISI) and the Edinburgh Postnatal Depression Scale (EPDS), respectively. A cutoff score ≥ 10 on the ISI indicated probable insomnia, and a cutoff ≥ 13 on EPDS indicated probable depression. Network analyses, utilizing expected influence (EI) and bridge expected influence (BEI), were conducted to determine central symptoms and bridge symptoms.
Results: Among the 480 expectant mothers (mean age: 33.0 ± 4.4 years, mean gestation week: 24.2 ± 5.9), the prevalence of probable insomnia and depression was 73.95% and 45.83%, respectively. The values of skewness and kurtosis of all symptoms were acceptable (skewness: -0.74 - 1.21, kurtosis: 1.91 - 3.47). Distress about sleep problems (ISI5) had the highest EI value, followed by Sadness (EPDS8), Unable to enjoy things (anhedonia) (EPDS2), and Feeling scared or panicky (EPDS5). Four bridge symptoms were identified: Difficulty initiating sleep (ISI-DIS), Difficulty sleeping (EPDS7), Feeling anxious/worried (EPDS4), and Distress about sleep problems (ISI5), suggesting that these symptoms exert simultaneous influence on both antenatal insomnia and depression, acting as a bridge connecting these two sets of symptoms.
Conclusion: Central symptoms and bridge symptoms identified in this network analysis should be targeted in the development of prevention and intervention strategies to address insomnia and depression among pregnant women.
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0968

PERCEIVED STRESS AND WORRY MEDIATE THE LINK BETWEEN SLEEP QUALITY AND IMMUNE FUNCTION

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Introduction: Given that college students have an increased risk for spreading infection (White et al., 2003), it is important to examine factors that influence the immune functioning of this population. The present work examined the effect of sleep quality on the immune function of college students. Sleep problems are highly prevalent among college students (Kloss et al., 1011). Poor sleep quality has been shown to be related to reduced immune function (Irwin, 2015), and among college students, it has been linked to a multitude of negative outcomes, including heightened perceived stress (Veeramachaneni et al., 2019). Not only does poor sleep predict stress levels (Wu et al., 2015), but worry is a common cognitive reaction to stress (Borkovec et al., 1998). Worry has also been associated with reduced immune function (Brosschot et al., 2006). Based on this evidence, the present work proposed a serial mediation model, in which sleep quality (X) was modeled to increase perceived stress (M1), which in turn, increases worry (M2), thereby resulting in a decreased in immune function (Y).
Methods: Participants were 391 undergraduate students (68.3% female; Mage = 19.19, SDage = ±2.03) who completed scales related to sleep quality, perceived stress, worry, and immune function.
Results: A serial mediation model tested whether perceived stress (M1) and worry (M2) sequentially mediated the relation between poor sleep quality (X) and immune functioning (Y). A 95% bias-corrected confidence interval based on 5,000 bootstrap samples indicated that the indirect effect of perceived stress alone (i.e., X→M1→Y) was non-significant (indirect effect = .05, SE = .03, 95% CI [-.00, .11]). Likewise, the indirect effect through worry alone (i.e., X→M2→Y) was also non-significant (indirect effect = .01, SE = .01, 95% CI [-.01, .11]). Lastly, and as hypothesized, poor sleep quality was an indirect significant predictor of immune functioning through perceived stress and worry, in a sequential manner (i.e., X→M1→ M2→Y; indirect effect = .04, SE = .02, 95% CI [.01, .07]).
Conclusion: Findings demonstrate the importance of college students' sleep in relation to both their mental health and subsequent immune functioning, rendering sleep as an important target for preventative intervention.
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0969

PREDICTING DIFFERENCES BETWEEN OBJECTIVE AND SUBJECTIVE SLEEP PARAMETERS WITH MENTAL HEALTH QUESTIONNAIRES

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Introduction: Differences between objectively and subjectively measured sleep can vary widely between participants and these differences may depend on individual characteristics, including mental health. The severity of mental health symptoms may be beneficial in assessing the magnitude of discrepancies between participants' objective and subjective data. This secondary data analysis examined the predictivity of validated measures of post-traumatic stress symptoms, anxiety symptoms, and depressive symptoms on differences between sleep electroencephalogram (EEG) and actigraphy with sleep diary data.
Methods: Adults in the community (N=80; Mage=32.65 years, 63% female, 88.8% White) completed the Post-Traumatic Stress Disorder Checklist, State-Trait Anxiety Inventory, Quick Inventory of Depressive Symptomatology, and seven days of sleep assessment via sleep diaries, actigraphy, and EEG. The mean absolute value of differences between the sleep diary, actigraphy, and EEG data was calculated for total sleep time, time in bed (TIB), sleep efficiency, sleep onset latency (SOL), wakefulness after sleep onset, terminal wakefulness, and number of awakenings. Stepwise linear regression was used to examine whether the anxiety, post-traumatic stress, and depressive symptom scores were significant predictors of the objective-subjective differences between these sleep parameters.
Results: Depressive symptoms significantly predicted differences between EEG and sleep diary data for SOL, $F(1,72)=9.958$, $p=.002$, $R2=0.121$. Anxiety symptoms significantly predicted differences between actigraphy and sleep diary data for SOL, $F(1,69)=6.335$, $p=.014$, $R2=0.084$. Anxiety and post-traumatic stress symptoms significantly predicted differences between actigraphy and sleep diary data for TIB, $F(2,70)=10.355$, $p<.001$, $R2=.228$, $\beta QIDS=0.62$, $\beta PCL=-.42$.
Conclusion: Anxiety, post-traumatic stress, and depressive symptoms significantly predicted EEG and actigraphy objective-subjective differences for SOL and TIB. To better assess whether these variations are due to measurement type or if there are individual characteristics responsible for the discrepancies (i.e., sleep state misperception, symptom of mental health), a larger sample with more longitudinal data is needed. Additionally, future studies may focus on clinical samples. For instance, SOL and TIB variations may be indicative of mental health concerns (i.e., hyperarousal, anxiety, depression).
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0970

REAL-WORLD USE OF SOLRIAMFETOL FOR EXCESSIVE DAYTIME SLEEPINESS IN PATIENTS REPORTING ANXIETY OR DEPRESSION

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Introduction: Psychiatric comorbidities are common in patients with excessive daytime sleepiness (EDS) from narcolepsy or obstructive sleep apnea (OSA). Real-world efficacy and safety data of wake promoting agents in these populations is limited. Solriamfetol (Sunosi®), a dopamine/norepinephrine reuptake inhibitor that activates TAAR1 and 5HT1A receptors, is approved to treat EDS associated with narcolepsy or OSA. Solriamfetol clinical trials excluded and the prescribing information caution against use in patients with severe psychiatric comorbidities, so limited data exists for this population. Here we describe real world use of solriamfetol in German patients with narcolepsy or OSA who self-reported depression/anxiety (yes/no response) at baseline.
Methods: We performed a retrospective chart review (SURWEY) using data from German physicians who prescribed solriamfetol to patients with EDS associated with narcolepsy or OSA and at a stable dose for ≥6 weeks. Comorbidities, including anxiety/depression, were documented with background information at baseline.
Results: Of the 154 patients, n=48 (31.2%) reported anxiety and/or depression (OSA, n=23/83 [27.7%], narcolepsy, n=25/71 [35.2%]). Most patients (≥85%) reported no additional psychiatric, neurological, or sleep disorder. Regardless of primary etiology, baseline mean±SD Epworth Sleepiness Scale (ESS) scores were generally similar in patients with (OSA, 16.0±2.8; narcolepsy, 17.9±3.6) and without (OSA, 16.0±3.3; narcolepsy, 17.5±2.9) anxiety/depression. Overall, mean±SD decreases in ESS scores were 4.6±3.2 and 5.2±3.6 with and without anxiety/depression, respectively; and similar in OSA (5.2±3.1 vs 5.5±3.9), narcolepsy (3.9±3.2 vs 4.9±3.3). Ninety percent of patients achieved ≥2-point reduction in ESS scores from baseline and patients (≥89%) and physicians (≥91%) reported improvement in EDS with solriamfetol, which were both similar across primary etiologies and anxiety/depression presence. Anxiety/depression data was not collected at follow-up. Common adverse events were headache, insomnia, and decreased appetite, which generally occurred at similar rates regardless of reported anxiety/depression.
Conclusion: These real-world data describe solriamfetol treatment outcomes in narcolepsy or OSA patients who did and did not self-report anxiety/depression. Regardless of anxiety/depression, ESS scores improved, and most patients and physicians reported improved EDS. Our findings are consistent with clinical trial results and suggest that solriamfetol is effective in managing EDS symptoms in this population regardless of common psychiatric comorbidities.
Support (if any): Axsome Therapeutics, Jazz Pharmaceuticals, Pharmanovia

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0971

REPETITIVE TRANSCRANIAL MAGNETIC STIMULATION FOR DEPRESSION CHANGES SLEEP ARCHITECTURE: PRELIMINARY RESULTS

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Introduction: There is a bi-directional relationship between sleep and depression, with sleep difficulties contributing to the risk of treatment resistant depression. The existing literature regarding the influence of repetitive transcranial magnetic stimulation (rTMS) treatment on sleep is limited. The present study seeks to investigate changes in brain activity during sleep in individuals with treatment resistant depression undergoing rTMS treatment.
Methods: As part of an ongoing randomized, double-blind clinical trial, participants underwent four or six weeks of daily rTMS sessions targeting the left or bilateral dorsolateral prefrontal cortex. Sleep was monitored at home with an ambulatory EEG device (Muse-S, Interaxon) or in the laboratory with standard polysomnography (N7000, Embla) for two consecutive nights before starting rTMS (the first night serving as an adaptation night) and one night after up to four weeks of rTMS.
Results: Our preliminary sample consisted of eight participants (25% females, age range: 31-64 years, M = 47.4, SD = 12.3). At baseline, all participants scored at least 15 on the Hamilton Rating Scale for Depression which corresponds to mild depression severity. On average, total sleep time did not change significantly from pre-intervention (6.2 + 1.3 hours) to after the last rTMS session (6.1 + 1.6 hours, p>.050). After the last rTMS session (M=4.6, SD = 3.1), the percentage of NREM1 sleep shortened significantly relative to what was observed before the intervention (M=5.9, SD = 2.8; p = .042) . Changes in other sleep stages did not reach statistical significance.
Conclusion: These preliminary findings suggest that rTMS treatment may reduce light sleep without affecting overall sleep duration in individuals with treatment resistant depression. If replicated in larger samples, such findings may highlight rTMS as a potential means of alleviating poor sleep commonly linked to depression.
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0972

REST-ACTIVITY RHYTHM PROFILES IN MAJOR DEPRESSIVE DISORDER: A CLUSTER ANALYSIS IN CHINESE POPULATION

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Introduction: Previous research has demonstrated that rest-activity rhythm (RAR) profiles, formed by individual RAR characteristics, were linked to the severity of depressive symptoms. Further investigation into RAR profiles could potentially facilitate the identification of depression and validate its role in depression. This study aimed to identify the RAR profiles in samples with and without major depressive disorder (MDD).
Methods: Actigraphy data were collected from 70 Chinese adults (34 with current MDD and 36 age- and gender-matched healthy controls) aged between 18 and 64. RAR measures were computed based on the collected 7-day actigraphy data, and a data-driven cluster analysis was performed to identify distinct RAR profiles. The associations between the actigraphy-derived RAR profiles and various psychiatric symptom/health-related measures, including anxiety and depressive symptoms, insomnia severity, fatigue, and quality of life, were examined.
Results: Two distinct groups with different RAR features ("earlier/robust" group: n = 63, 90%; "later/irregular"; n = 7, 10%) were identified from the sample using cluster analysis. The "later/irregular" group exhibited later activity onset and acrophase, along with lower levels of robustness and regularity compared to the "earlier/robust" group. Regarding psychiatric symptom/health-related measures, the "later/irregular" group displayed significantly higher levels of depressive symptoms [$t(8.77) = -3.36$, $p < .05$], insomnia severity [$t(15.3) = -6.85$, $p < .05$], fatigue [$t(8.80) = -2.68$, $p < .05$], and a higher percentage of participants with current MDD [$\chi2(1) = 4.30$, $p < .05$] relative to the "earlier/robust" group. However, insignificant differences in health-related quality of life [$t(7.71) = 2.27$, $p = .054$] were found between two groups.
Conclusion: The current findings contribute further evidence on the association between RAR profiles and MDD, suggesting that RAR profiles could potentially be a biological marker for identifying depression. The observed associations between RAR profiles and other related symptoms demonstrated the utility of RAR profiles in detecting other health-related concerns. However, it is important to note that confirmatory studies with larger sample sizes and longitudinal designs are necessary to validate these findings and reveal the underlying mechanisms and temporal relationship between circadian rhythms and depression.
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0973

ROMANTIC PARTNERSHIP MITIGATES THE INFLUENCE OF ANXIETY AND MOOD ON SLEEP DISTURBANCE IN FULL-SERVICE SEX WORKERS

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Introduction: In the United States, an estimated 1-2 million full-service sex workers (FSSW) face notable physical and mental health challenges, including increased depression, anxiety, and sleep difficulties as compared to the general population (Ramos et al., 2022). The "partnership-health associations" concept suggests that romantic relationships may protect mental and physical well-being (Du Bois et al., 2021). Notably, a recent study found no significant health outcome differences between partnered and non-partnered FSSW at the univariate level (Du Bois et al., 2023). This secondary analysis aims to explore whether partnership buffers the link between mood, anxiety, and sleep disturbance among FSSW.
Methods: 83 FSSW completed the Patient Reported Outcomes Measure Information System-29 (PROMIS-29) online from November 2019-February 2020. Four moderation analyses, utilizing PROCESS, examined anxiety and depression as predictor variables and global sleep disturbance score as an outcome, with partnership status (partnered versus non-partnered) as the moderating variable.
Results: The sample was primarily white (81.9%), non-Hispanic (77.1%), and cisgender female (66.3%), with a mean age of 28.01 (±4.25) years. The overall model for partnership status

as a moderator of the association between anxiety and sleep disturbance was significant (F(3, 79)=17.65,p<.001,R2=.40). The interaction effect showed a significant link between increased anxiety and sleep disturbance for both non-partnered FSSW (b=0.88,SE=0.13,t(79)=6.74, p<.001) and partnered FSSW (b=0 .35,SE=0.14,t(79)=2.48,p<.05), with a more pronounced association for non-partnered FSSW. Similarly, the overall model for the association between depression and sleep disturbance was significant (F(3, 79)=12.50,p<.001,R2=.32). The interaction effect indicated a significant link between increased depression and sleep disturbance for both non-partnered FSSW (b=0.75,S E=0.13,t(79)=5.61,p<.001) and partnered FSSW (b=0.34,SE=0 .15,t(79)=2.18,p<.05), with a more pronounced association for non-partnered individuals.

Conclusion: Analyzing mental-physical health associations at a multivariable level provides a nuanced understanding that partnership may protect against unfavorable mood, anxiety, and sleep health associations in FSSW. Future studies should include a larger sample size and explore specific underlying mechanisms by which romantic partnership relates to a protective effect of low mood and high anxiety on sleep, both in FSSW and other groups who experience health inequities.

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0974

SLEEP CHARACTERISTICS AND DEPRESSION AND ANXIETY SYMPTOMS AMONG ADULTS WITH INFLAMMATORY BOWEL DISEASE

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Introduction: Inflammatory Bowel Disease (IBD) is a chronic, immune-mediated condition, encompassing Crohn's disease (CD) and ulcerative colitis (UC). Up to 80% of individuals with IBD report poor sleep quality. However, there is limited information on factors that predict sleep characteristics in this population. This study aims to explore the associations between demographic, clinical, and psychological factors with sleep characteristics in adults with IBD.

Methods: We conducted a retrospective analysis of two IBD sleep studies. Participants aged 18-64 years old with a diagnosis of IBD were recruited from two academic medical centers and completed Patient-Reported Outcomes Measure Information System (PROMIS) depression and anxiety questionnaires and wore a wrist actigraph for 10 days continuously. We employed Independent T-Tests and Pearson's correlation to assess the association of biologic treatment, IBD type, sex, depression, and anxiety on sleep efficiency (SE), total sleep time (TST), and sleep onset latency (SOL).

Results: We included 58 participants with a mean age of 35.6 years (SD=12.1). 60.3% were female, and 60.3% were diagnosed with CD. The mean depression score was 51.3 (SD = 10.2) and the anxiety score was 52.2 (SD = 15.5). The mean SOL was 19.3 minutes (SD = 15.5), TST was 413.3 minutes (SD = 53.2), and SE was 83.5% (SD = 5.7). TST was significantly longer in females compared to males (427.4 vs. 391.9 minutes , p< 0.05). SE was significantly higher among females compared to males (85.1% vs. 81.0%, p< 0.001) and among individuals with Crohn's disease compared to Ulcerative colitis ((85.1% vs. 81.0%, p< 0.01). SOL was longer among individuals with Ulcerative colitis compared to Crohn's disease (15.6 vs.25.0minutes , p< 0.05). Depression and anxiety scores were not significantly correlated with any sleep characteristic.

Conclusion: Sleep continuity was poor in people with IBD. Given that we found sex and IBD type impacted sleep continuity, these factors should be considered in future precision sleep health interventions for this population.

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0975

MEDIATORS OF THE INSOMNIA-SUICIDALITY ASSOCIATION

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Introduction: Insomnia severity is a significant risk factor for heightened suicidality, including ideation, attempts, and death by suicide. As a modifiable risk factor, insomnia is a potential target for suicide prevention; however, the models explaining the association between insomnia and suicidality remain unclear. Our model posits that insomnia hinders sleep's regional recuperative brain functions, contributing to daytime impairments, including emotional dysregulations. Another model links insomnia to suicidality through additional factors including perceived burdensomeness and thwarted belongingness. Each of these potential factors are associated with both insomnia and suicidality. This study aimed to investigate potential psychological mechanisms in the insomnia-suicidality association, using validated measures in a nationally representative sample.

Methods: Through a Qualtrics survey, participants (N=428) completed the Difficulties in Emotion Regulation Scale to assess emotional dysregulation, Interpersonal Needs Questionnaire to measure perceived burdensomeness and thwarted belongingness, Frequency of Suicidal Ideation Inventory to assess suicidality severity, Insomnia Severity Index, and PROMIS–Depression, and -Anxiety short forms. We used regression analyses to investigate the association between insomnia, suicidality severity, and demographic variables. Structural equation modeling was used to determine whether emotional dysregulation, perceived burdensomeness, or thwarted belongingness mediated the insomnia-suicidality severity association, even when accounting for depression.

Results: Insomnia severity was related to greater suicidality (p< 0.001, CI=0.19–0.31). This association was mediated by depression severity (p=0.836, CI=-0.06–0.08). Emotion dysregulation and perceived burdensomeness partially mediated the insomnia-suicidality severity association (β=0.06, p=0.001; β=0.18, p< 0.001), and when accounting for depression severity, fully mediated the insomnia-suicidality severity association (β=0.04, p=0.045; β=0.24, p< 0.001). Thwarted belongingness did not mediate the association before (β=0.02, p=0.142) or after accounting for depression (β=0.01, p=0.412).

Conclusion: This study replicates considerable evidence that insomnia is an important marker and risk factor for suicidality. The mechanisms through which insomnia may confer risk for suicidality include depression, emotion dysregulation, and perceived burdensomeness. Insomnia may be an ideal upstream target for reducing suicidality and its risk factors including depression, emotion dysregulation, and perceived burdensomeness.
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0976

A BRIEF NON-PHARMACOLOGICAL INSOMNIA TREATMENT FOR MILITARY SUICIDAL BEHAVIORS: A SHAM-CONTROLLED, RANDOMIZED TRIAL

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Introduction: Suicide represents a public health emergency among veterans, who die by suicide at alarming rates and show elevated sleep disturbances. Selective interventions for military suicide indication are scarce, and available treatments remains mismatched to the acute nature of a suicidal crisis. We sought to develop and test preliminary efficacy of a fast-acting, behavioral insomnia intervention for antisuicidal response in the context of a sham-controlled, randomized trial among veterans.
Methods: A multicomponent behavioral sleep intervention was developed, integrating: CBT for Insomnia (CBTi) and Imagery Rehearsal Treatment (IRT) within a rapid (4-session) format (SERVE: Sleep Enhancement for Returning Veterans). This was compared to active control, Arousal-Based Treatment of Insomnia (ABTI). Treatments were manualized and matched for therapist contact, materials (manuals, powerpoints, guidesheets), and passage of time. Raters were blind to treatment assignment. Inclusion criteria: (a) age>18, (b) clinically-significant sleep disturbance (Insomnia Severity Index (ISI>10)), (c) DSM-V-Defined Depression, or (d) current suicidal ideation (Columbia Suicidal Severity Rating Scale (CSSRS>1)). A comprehensive data and safety monitoring plan supported standardized risk assessment, safety planning, and triage. Outcomes were assessed at Baseline and Posttreatment (1,3 mos) according to primary (suicidal ideation), secondary (sleep indices), and exploratory (mood, stress indices) outcomes.
Results: Recruitment occurred by way of comprehensive military partnerships, clinic referrals, and community flyering. Of n=753 new contacts, n=436 participants were screened for inclusion. Of these, n=112 were interviewed by full-battery eligibility assessment, resulting in n=77 veterans enrolled and randomized to: Active Treatment (n=39) vs. Active Control (n=38). Feasibility analyses supported high rates of acceptance, tolerability, and safety. For the full sample, t-tests revealed large posttreatment reductions in suicidal ideation (CSSRS, p<.001; Depressive Symptom Inventory Suicidality Subscale (DSISS)), p<.001), sleep, mood, and stress outcomes (ISI, p<.01; DDNSI, p<.01; QIDS-SR, p<.01; PCL, p<.001). Effects were significant compared to control (DSISS, p<.01; ISI, p<.01).
Conclusion: A brief, non-pharmacological insomnia intervention resulted in antisuicidal response and large posttreatment improvements in sleep and well-being. This is the first known report testing non-medication insomnia treatment within a sham-controlled, randomized trial for military suicidal behaviors, where results support feasibility, safety, and therapeutic impact to suicidal risk.
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0977

A NON-PHARMACOLOGICAL INSOMNIA TREATMENT FOR SUICIDAL BEHAVIOR IN HIGH-RISK CIVILIANS: AN OPEN-LABEL CLINICAL TRIAL

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Introduction: Suicide has emerged as a public health crisis, where interventions remain scarce, unacceptable, and inaccessible to those high in need. By comparison, poor sleep is non-stigmatizing, visible, and highly treatable as a risk factor and transdiagnostic intervention target in suicide prevention. Aim 1: To develop, manualize, and test feasibility of a sleep-oriented treatment for suicidal behaviors within an open label clinical trial. Aim 2: To test antisuicidal response and indications of efficacy posttreatment across primary (suicidal ideation), secondary (sleep indices), and exploratory (mood indices) outcomes.
Methods: A multicomponent selective treatment was developed integrating: CBT for Insomnia (CBTi), Imagery Rehearsal Treatment (IRT), and Social Rythyms Treatment (SRT) (to address insomnia, nightmares, sleep variability) within an abbreviated (5-session) format (iSleep: Insomnia Treatment for Improved Well-Being). Treatment was manualized across session-by-session materials (powerpoints, homework, therapist guidesheets). Participants were enrolled based on screening and inclusion criteria: (a) age >18, (b) clinically-significant sleep disturbance (Insomnia Severity Index (ISI>10)); Pittsburgh Sleep Quality Index (PSQI>5)), (c) DSM-V-Defined Major Depressive Disorder, (d) current suicidal ideation (Columbia Suicidal Severity Rating Scale (CSSRS>1)). Comprehensive data and safety monitoring procedures were used to support risk assessment, triage, and outpatient safety planning. Outcomes were assessed at Baseline, Treatment, and Posttreatment (1,3 mos) timepoints.
Results: Of n=590 new contacts, n=310 participants were screened for high suicide risk. Fifty-nine participants were

interviewed by full-battery eligibility assessment, resulting in n=35 participants enrolled for treatment allocation. Feasibility analyses demonstrated high rates of acceptance, tolerability, and safety. Paired t-tests revealed large posttreatment reductions in suicidal ideation (CSSRS, p<.001), in addition to secondary outcomes of sleep disturbance (ISI, p<.001; DDNSI, p<.001) and depression (QIDS-SR, p<.001). Effects were large and sustained through study follow up.

Conclusion: A non-pharmacological insomnia intervention (iSleep Treatment) resulted in antisuicidal symptom response and posttreatment improvements in sleep and overall well-being. Effects were large and observed across primary, secondary, and exploratory outcomes. This is the first known report testing use of a newly-developed, multicomponent insomnia treatment within an open label suicide prevention clinical trial, demonstrating excellent feasibility, safety, and therapeutic impact to suicidal risk.

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0978

A SPECTRUM OF ALTERED NON-RAPID EYE MOVEMENT SLEEP IN SCHIZOPHRENIA

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Introduction: Multiple facets of sleep neurophysiology, including electroencephalography (EEG) metrics such as non-rapid eye movement (NREM) spindles and slow oscillations (SO), are altered in individuals with schizophrenia (SCZ). However, beyond group-level analyses which treat all patients as a unitary set, the extent to which NREM deficits vary among patients is unclear, as are their relationships to other sources of heterogeneity including clinical factors, illness duration and ageing, cognitive profiles and medication regimens.

Methods: Using newly collected high-density sleep EEG data on 103 individuals with SCZ and 68 controls, we first sought to replicate our previously reported (Kozhemiako et. al, eLife, 2022) group-level mean differences between patients and controls (original N=130). Then in the combined sample (N=301 including 175 patients), we characterized patient-to-patient variability in NREM neurophysiology. Sleep EEG preprocessing was conducted using an open-source package called Luna (http://zzz.bwh.harvard.edu/luna/).

Results: We replicated all group-level mean differences and confirmed the high accuracy of our predictive model (Area Under the ROC Curve, AUC = 0.93 for diagnosis). Compared to controls, patients showed significantly increased between-individual variability across many (26%) sleep metrics, with patterns only partially recapitulating those for group-level mean differences. Although multiple clinical and cognitive factors were associated with NREM metrics including spindle density, collectively they did not account for much of the general increase in patient-to-patient variability. Medication regime was a greater (albeit still partial) generator of variability, although original group mean differences persisted after controlling for medications. Some sleep metrics including fast spindle density showed exaggerated and accelerated age-related effects in SCZ, and patients exhibited older predicted biological ages based on an independent model of ageing and the sleep EEG.

Conclusion: We demonstrated robust and replicable alterations in sleep neurophysiology in individuals with SCZ and highlighted distinct patterns of effects contrasting between-group means versus within-group variances. That increased NREM heterogeneity was not explained by traditional clinical or cognitive patient assessments suggests the sleep EEG provides novel, nonredundant information to support the goals of personalized medicine. Collectively, our results point to a spectrum of NREM sleep deficits among SCZ

Support (if any):

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0979

ASSOCIATIONS AMONG YOUNG ADULTS' SLEEP QUALITY AND SLEEPINESS, RISK-TAKING BEHAVIORS, AND E-CIGARETTE ATTITUDES

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Introduction: Young adulthood is both a time of initiation and progression to habitual tobacco use and when risk-taking behaviors (e.g., sensation seeking and impulsivity) peak. Poor sleep quality and greater daytime sleepiness may influence greater risk-taking, which may, in turn, increase susceptibility to use tobacco products. We explored associations among young adults' sleep quality and sleepiness, risk-taking, and susceptibility and motivation to use electronic cigarettes (e-cigarettes), the most popular tobacco product among this age group.

Methods: In an online survey, young adults recruited from social media who did not use e-cigarettes in the past 30 days (N=75) completed questions about their sleep quality (Pittsburgh Sleep Quality Index [PSQI], higher scores = greater sleep problems) and sleepiness (Epworth Sleepiness Scale [ESS], higher scores = greater daytime sleepiness), risk-taking (sensation seeking and impulsivity), susceptibility to use e-cigarettes, and motivations to avoid e-cigarettes in the future. Using a series of PROCESS mediation models, we examined the association between sleep (quality and sleepiness) and susceptibility and motivation to use e-cigarettes when mediated by risk-taking.

Results: Participants identified as predominantly female (77%), non-Hispanic White (60%), and were on average 23 years old (range: 18 to 26 years). Higher PSQI scores were significantly associated with greater sensation seeking (p = 0.02). Greater sensation seeking was associated with greater susceptibility to use e-cigarettes (p = 0.03). The indirect effects were significant (95% CI [0.002, 0.064]) while the direct effect between PSQI

and susceptibility was not. Similarly, higher ESS scores were significantly associated with greater impulsivity (p = 0.01). Greater impulsivity was significantly associated with lower motivations to avoid e-cigarettes (p = 0.01). The indirect effects were significant (95% CI [-0.100, -0.004]) while the direct effect between ESS and motivation was not. No other associations were significant.
Conclusion: We provide preliminary evidence on how worse sleep is indirectly associated with increased susceptibility/motivation to use e-cigarettes through risk-taking. This complex association between sleep health and e-cigarette susceptibility should be further examined.
Support (if any): This work was supported by the National Institute on Drug Abuse at the National Institutes of Health (NIH, Grant # R00DA046563 Supplement).

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0980

CIRCADIAN PATTERNS OF AGGRESSIVE BEHAVIORS IN A MENTAL HEALTH CARE FACILITY

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Introduction: There are indications that circadian rhythms regulate certain aspects of emotions and behaviors. Yet, little is known about the potential diurnal rhythm of behavioral problems in individuals at risk for both circadian and emotional deregulation. This study investigates whether the frequency of aggressive behaviors among individuals receiving mental health care in a tertiary psychiatric facility follows a circadian pattern.
Methods: The timing of all "code white" alerts, emergency notifications of aggressive behavior, were documented from the hospital occupational safety team during 2022 and collated for secondary data analysis. A repeated measures ANOVA was performed on the hourly frequency of code white alerts across 24-hours and a Fourier series model was fitted to the data to extract parameters of a putative circadian curve.
Results: Preliminary results reveal a significant time of day effect on code white alerts ($F(23, 8349) = 9.58$, $p < .001$). Visual inspection show a sinusoidal pattern in the hourly counts of code white alerts, with an acrophase between 2 PM and 3 PM and a nadir between 3AM and 4AM. This was confirmed by the curve fitting (Adjusted R-square =.91).
Conclusion: These initial findings suggest a circadian modulation in the occurrence of aggressive behaviours in people receiving mental health care. While further work is required to understand underlying mechanisms, this phenomenon may be linked to the decrease in alertness and energy levels in the afternoon, which may make emotional regulation and decision-making more challenging. Better understanding of the influence of circadian factors on aggressive behaviors may facilitate self-regulation strategies and guide healthcare teams in preventing and better tailoring their responses to behavioral emergencies.
Support (if any): NA

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0981

GENDER HAS INVERSED ROLES IN A MODEL LINKING LIFETIME SUBSTANCE USE AND SLEEP

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Introduction: The knowledge about the relationship between sleep and substance use constantly undergoes change. Many questions still remain, including how substance use initiation correlates to sleep parameters. In order to expand this body of knowledge, this study aimed at evaluating how lifetime substance use predicts changes in objective and subjective sleep parameters.
Methods: Volunteers from the EPISONO 2007, a large-scale epidemiological study assessing sleep in a representative sample from the city of São Paulo, Brazil, filled in questionnaires evaluating their general health, and underwent a full-night polysomnographic exam. For this analysis the first question of the Alcohol, Smoking and Substance Involvement Screening Test (ASSIST), asking if the individual ever used any of the listed substances, was considered. Age and scores in the Beck Depression and Anxiety Indexes were included as covariates. Gender was also added as an independent variable.
Results: From the total 1,042 participants, 876(388 men and 488 women) were included. Volunteers reported use of cannabis(n=181), cocaine(n=79), inhalants(n=69), amphetamines(n=54), sedatives(n=31), alcohol(n=802) and tobacco(n=538). Lifetime use of cannabis, cocaine and sedatives directly correlated to alterations in sleep latency, REM sleep onset latency, sleep efficiency and scores in the Epworth Sleepiness Scale. Gender significantly interacted with substance use, with women who consumed cocaine and cannabis and men who never did presenting increased total sleep time when compared to their counterpart groups (men who ever consumed these substances and women who never did).
Conclusion: We found not only an effect of the lifetime consumption of popular drugs, such as cocaine and cannabis, but also identified an important role for gender, which seems to have inversed roles in males and females. These results provide an intriguing lead to unravelling a network in which gender, sleep and substance use are present, and advances in this area will be a major step in the investigation of the importance of sleep in the psychopharmacology scenario.
Support (if any): Our studies are supported by grants from the Associacão Fundo de Incentivo à Pesquisa (AFIP) and Fundação de Amparo à Pesquisa do Estado de São Paulo (FAPESP – grant #2020/13467-8 to MLA). MLA is a Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq) fellowship recipient.

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0982

QUADRATIC ASSOCIATION BETWEEN ECOLOGICALLY ASSESSED SLEEP DURATION AND NEXT-DAY SUICIDAL IDEATION IN YOUTH

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Introduction: Sleeping too little or too much has been linked to adverse mental health outcomes in youth. Most studies that described the link between sleep duration and suicide risk in youth, however, relied on a single assessment of sleep and suicidal ideation, with considerable temporal gaps in between. Characterizing the proximal link between sleep duration and suicide risk in children and adolescents is essential for developing informative, early mobile interventions. We examined the association between ecologically assessed suicidal ideation (SI) and sleep duration in youth recruited after a partial hospitalization program. We also examined contextual factors in relation to sleep duration that are particularly salient for youth, including nighttime social media use and social media use-related self-referential cognitions.
Methods: We used ecological momentary assessment (EMA) 3 times/day over two weeks in discharged partial hospital patients to assess their levels of SI at home (n=79; 62% assigned F at birth; ages 12-15; mean 13.52; sd 1.14 yr). We also asked youth to report their bedtimes and waketimes every morning for two weeks. Social media use was assessed once via a questionnaire.
Results: Using generalized linear mixed models, we showed a significant quadratic effect of sleep duration on next-day SI (B=–0.04, SE =0.01, p< 0.001). The turning point of the quadratic function was the sleep duration of 10 hours. Specifically, longer sleep was linked to lower next-day SI, with this association reversing at 10 hours of sleep. Nighttime social media use (B=–0.18, SE =0.05, p< 0.001) and engaging in social media use-related self-criticism (B=–0.10, SE =0.05, p< 0.05) were both linked to shorter sleep duration, whereas daytime social media use was not associated with sleep duration (p>0.05).
Conclusion: These preliminary findings point to a curvilinear association between how long children and adolescents sleep and how much they think about suicide the following day and highlight the significance of social media use at bedtime. The findings emphasize the potential clinical relevance of daily assessment of sleep duration in developing adaptive, just-in-time interventions to decrease suicide risk in youth.
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0983

RECIPROCAL RELATIONS BETWEEN SLEEP AND ALCOHOL USE

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Introduction: Prior studies have established a longitudinal association between sleep disturbance and the development of alcohol use disorder. Experimental research also shows that alcohol intake negatively impacts sleep. The present study evaluated the reciprocal relationship between sleep and alcohol use with intensive longitudinal methods. We hypothesized that sleep disturbance would predict greater next-day alcohol intake and that greater alcohol intake would predict greater same-night sleep disturbance.
Methods: 50 college students (70% female, mean age 24) participated in a two-week study assessing their daily sleep and alcohol use patterns. Participants wore the Phillips Actiwatch Spectrum and completed daily diaries capturing self-reported sleep and alcohol intake. Multi-level zero-inflated binomial models assessed whether prior sleep predicted next-day alcohol use, including the likelihood of abstaining from alcohol the next day and alcohol intake amongst individuals who do drink. Linear multi-level models assessed whether alcohol use predicted daily sleep. All models assessed both within-subject (daily) and between-subject (average) effects because daily variations in sleep may influence alcohol use separately from average patterns and vice versa—models controlled for race, age, and gender.
Results: Participants with greater average sleep onset latency (SOL) were less likely to drink the next day (OR: 1.02 p < .05). Among those who drank, greater average wake after sleep onset (WASO) and SOL and shorter daily total sleep time (TST) predicted greater next-day alcohol intake (WASO IR: 1.01; SOL IR: 1.01; TST IR: 0.998; p < .05). Higher average alcohol intake predicted increased daily WASO (B = 10.3, SE = 4.4, p < .05), TST (B = 15.0, SE = 5.1, p < .05), and decreased daily sleep quality (B = -0.13, SE = .06, p < .05). Daily alcohol intake did not predict sleep variables.
Conclusion: These results suggest there is a dynamic reciprocal relationship between sleep and alcohol use. Individuals with worse average sleep continuity were less likely to drink alcohol. However, among those who chose to drink, lower average sleep continuity and shorter daily sleep duration predicted greater alcohol intake. These results suggest that sleep disturbance is a risk factor for developing excessive alcohol use.
Support (if any): Idaho State University, Graduate School; PSI CHI; INBRE.

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0984

SLEEP, ANXIETY, DEPRESSION, AND DEMAND FOR WEARABLES IN ADULTS WITH AUTISM SPECTRUM DISORDER VERSUS CONTROLS

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Introduction: Sleep difficulties are common in Autism Spectrum Disorder (ASD) populations. While much literature exists on sleep difficulties in ASD children, there is relatively scant research on adults. ASD is frequently co-morbid with symptoms of anxiety or depression, which are independently related to sleep problems. Personalized feedback from wearables may appeal to ASD adults looking to improve their sleep. This study examined sleep quality and severity of anxiety/depression in ASD adults with comorbid anxiety/depression and matched controls and establish demand for information about sleep from wearables in each group.
Methods: Participants were recruited through Prolific; 100 ASD adults with anxiety/depression and 100 matched controls with anxiety/depression completed the survey. Participants completed the Pittsburgh Sleep Quality Index (PSQI), General Anxiety Scale (GAD-7), Center for Epidemiologic Studies Depression Scale (CESD-10), and a task to establish demand for wearables that provide sleep or blood oxygenation information. Student's t-tests and Cohen's d examined between-group differences. Pearson's chi-squared test (χ^2) examined differences between expected and observed frequencies of GAD-7 categories and poor sleepers (PSQI ≥ 5) between groups.
Results: Participants in the ASD group had higher anxiety (t=3.42, d=0.47, p=0.001) and depression (t=3.23, d=.45, p=0.001) than controls. Bad sleepers had higher anxiety

(t=5.20, d=0.99, p< 0.001) and depression (t=5.17, d=0.98, p< 0.001) than good sleepers. Individuals in the autistic group had higher frequencies of moderate or severe anxiety than expected (χ^2=12.90, p=0.05); control participants had lower frequencies of poor sleepers than expected (χ^2=3.19, p=0.07). Both groups demonstrated more robust demand for sleep data than blood oxygenation data. ASD participants had more robust demand than matched controls for any wearable data.
Conclusion: ASD participants may have a higher burden of mental health and sleep issues relative to controls. The effect sizes suggest that self-report sleep quality was more strongly related to self-report depression and anxiety than autism diagnosis status. The demand task offers a novel framework to examine interest in potential sleep solutions in adult populations with co-morbid mental health diagnoses. ASD participants may have a greater interest in data from wearables; next steps will explore whether feedback from wearables can improve sleep in an adult ASD population.
Support (if any): NA

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0985

COMPARISON OF VARIOUS SLEEP MEASUREMENT DEVICES IN PSYCHIATRIC PATIENTS

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Introduction: Sleep disturbances are key symptoms in psychiatric disorders. Despite the development of various methods to assess sleep patterns and their quality, the concordance between these methods in those with psychiatric disorders is unclear. In particular, it is not well understood how comorbid symptoms of depression and obstructive sleep apnea (OSA), which are common in psychiatric disorders, relate to the concordance of sleep measurements.
Methods: In this study, 62 individuals with psychiatric disorders from Nagoya University Hospital were included as participants. Their sleep was monitored using several methods: polysomnography (PSG), a portable EEG device called Zmachine, Fitbit, and sleep logs. The morning after the sleep measurement with these objective sleep devices for a single night, participants estimated their sleep duration subjectively. To evaluate sleep parameters, Intraclass Correlation Coefficients (ICCs) were used. This research was carried out following the approval of the Ethics Review Committees at Nagoya University Hospital, and written consent was acquired from all participants.
Results: PSG and Zmachine demonstrated moderate concordance in Total Sleep Time (TST: ICC=0.46), Wake After Sleep Onset (WASO: ICC=0.39), and Sleep Efficiency (SE: ICC=0.40). However, there was a lack of agreement between PSG and Zmachine parameters with Fitbit, and between Fitbit and sleep logs. Sleep logs showed minimal correlation with PSG and Zmachine for TST and WASO, and a slight agreement for SE with Zmachine. When participants with severe OSA were excluded, ICCs for TST, WASO, and SE between PSG and sleep logs improved marginally (TST: ICC=0.27; WASO: ICC=0.38; SE: ICC=0.22). Excluding participants with severe depression, the TST ICC for PSG and sleep logs were slightly elevated (TST: ICC=0.24). However, even when participants with severe depression and OSA were excluded, ICCs between Fitbit and other sleep measurement methods did not elevate.
Conclusion: Our results indicated that Fitbit has a discrepancy when comparing data from PSG and sleep logs in individuals with psychiatric disorders. Although the growing adoption of Fitbit for sleep measurement, it is essential to acknowledge its weakness in the assessment of individuals with psychiatric disorders.
Support (if any):

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0986

INTER-INDIVIDUAL DIFFERENCES IN SLEEP ARCHITECTURE OF PATIENTS RECEIVING METHADONE FOR OPIOID USE DISORDER

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Introduction: Methadone treatment for opioid use disorder (OUD) reduces drug cravings and promotes abstinence, but sleep disturbances can negatively impact OUD recovery outcomes. Irregular sleep architecture and respiratory disturbance in outpatients administered methadone as medication for OUD (MOUD) are common, but inter-individual differences may be substantial. We investigated the magnitude and stability of inter-individual differences in sleep architecture and respiratory measures in outpatients in their first 90 days of MOUD treatment.
Methods: N=6 adults (42.5±10.4y, four females) enrolled in local MOUD programs participated in this research study. The daily methadone dose varied between participants (75.8±23.2mg, range 50-120mg). All participants reported past use of multiple substances; four reported current mental health disorders; and four reported chronic pain. As part of the study, participants underwent two consecutive nights of cardiorespiratory PSG, with lights off at 21:49 on average (range 21:17-22:16) on both nights. Sleep stages and apnea-hypopnea index (AHI) were analyzed for systematic inter-individual differences using variance components analysis. The stability of inter-individual differences was quantified with the intraclass correlation coefficient (ICC, ranging from 0 to 1 for negligible to complete stability).
Results: On night one, mean±SD was 441.9±21.1min for total sleep time (TST), 9.0±5.2min for sleep latency (SL), 35.3±22.4min for wakefulness after sleep onset (WASO), 28.8±26.6min for N1, 220.8±58.6min for N2, 114.0±77.2min for N3, and 78.3±65.6min for REM. AHI scores were 16.4±9.1, indicating moderate sleep apnea on average. Compared to similarly aged healthy adults, N1 was low, and TST, WASO, N2, REM, and AHI were high. Stability was significant and substantial for N1, N2, REM, and AHI (ICC≥0.68, F≥5.19, P< 0.05).
Conclusion: Despite small sample size, we found substantial, stable inter-individual differences in N1, N2, REM, and AHI, whereas TST, SL, WASO, and N3 did not reach statistical significance. Varying methadone doses, prior substance use, physical and mental health, chronic pain, and (epi)genetic predisposition may partially account for these inter-individual differences.

Our PSG data were collected in-laboratory, not naturalistically; results should be interpreted accordingly. Given the substantial, stable inter-individual differences in sleep architecture, a personalized approach to sleep management may be crucial to help improve OUD recovery outcomes.
Support (if any): WSU ORAP and HSCL

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0987
PHYSICAL ACTIVITY AS A TOOL TO IMPROVE SLEEP QUALITY FOR SECURE PSYCHIATRIC INPATIENTS: A PILOT FEASIBILITY STUDY

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Introduction: People with severe mental illness (SMI) may receive inpatient care in a secure facility. Due to highly prevalent sleep disorders such as insomnia, and common daytime behaviours such as napping and inactivity, many of these patients experience disrupted sleep/wake cycles. Sleep/wake cycles can be retrained by increasing daytime physical activity (PA), however, patients with SMI are highly sedentary. For sedentary groups, engaging in multiple short bouts of PA across the day may feel more attainable than completing one longer bout. Therefore, we conducted a pilot study to investigate the feasibility of an intermittent PA intervention to improve sleep quality for psychiatric inpatients residing in secure healthcare.
Methods: N=22 inpatients (40.0±16.9y, 16 males) from a secure psychiatric hospital (England) participated in a ten-week, theory-informed, PA intervention. Participants were instructed to engage in three ten-minute bouts of PA/day, five days/week, completed at a self-selected intensity. At baseline, mid-point (week 5), and post-intervention, inpatients completed questionnaires, including the Insomnia Severity Index (ISI) (primary outcome). The wrist-worn Motionwatch8 actigraph was used to record sleep and PA data (including total sleep time (TST), sleep efficiency (SE), and moderate-to-vigorous PA (MVPA)).
Results: Pre-to-post intervention, mean ISI scores decreased from 12.14 (SD=4.98) to 11.38 (SD=6.18) ($t(20)=0.65, p=0.53$). Actigraphy data was used to derive five time-points across the sleep/wake cycle. Mean wake time advanced by 34min (SE=15.92min), time to get out of bed advanced 34min (SE=14.31min), and mid-point of sleep advanced 38min (SE=15.93min). These advances were significant ($p< 0.05$). Mean time to bed and time to sleep also advanced (both $p>0.05$). Mean MVPA increased by 17min/day ($T=1.17$, $p>0.05$). Other sleep indices (including TST, SE) did not change significantly. PA adherence scores were highly variable person-to-person. All participants remained in the trial from intervention week 1 to post-intervention.
Conclusion: Intermittent PA can decrease insomnia symptoms and significantly advance sleep phase in secure psychiatric inpatients. Though habitually sedentary, MVPA can be increased in this population. The impact of age, gender, or diagnosis could not be specified due to small sample size. Future research with larger, more diverse samples would be beneficial to support these promising early results.
Support (if any): Loughborough University (UK), St Andrew's Healthcare (UK)

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0988
EVALUATION OF SLEEP DISORDERS IN COLLEGE STUDENT ATHLETES

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Introduction: College student athletes experience unique factors in addition to those of being a traditional college student that may exacerbate sleep difficulties and/or mental health difficulties which may in turn negatively affect sleep (e.g., competition pressures, training, travel demands). Previous research has found that mental health problems are common in this population, however, less attention has been given to the evaluation of sleep disorders. This study provides an evaluation of sleep disorder questionnaires and comparison with a structured clinical sleep disorders interview (SCISD-R).
Methods: College student athletes (N = 114) from two Universities completed self-report questionnaires and participated in a clinical interview. Average total scores were calculated for the Epworth Sleepiness Scale (ESS), Nightmare Disorders Index (NDI), Reduced Composite Scale of Morningness (rCSM), Sleep Condition Indicator (CSI), Shiftwork Disorder Index (SWDI), STOP-Bang Questionnaire, PROMIS Sleep Disturbance B (SD) and Sleep Related Impairment (SRI), and International RLS Rating Scale (IRLS-RS). Diagnostic criteria were calculated for the SCISD-R, NDI, SCI, and SWDI. Endorsement of Insomnia Identity ("I am an Insomniac") was obtained.
Results: Averages and standard deviations are as follows: ESS = 6.75±3.16; NDI = 2.83±3.38; rCSM = 20.42±2.92; SCI = 24.87±5.92; SWDI = 3.11±2.03; STOP-Bang = 1.28±1.06; PROMIS SD = 18.05±6.35; PROMIS SRI = 17.37±6.46; IRLS-RS = 2.70±4.62. Diagnostic criteria for assessments and clinical interview with shared symptoms are as follows: Nightmare disorder: 4 participants met criteria on the NDI and 3 met criteria on the SCISD-R. Insomnia disorder: 1 participant met criteria on the SCI and 10 met criteria on the SCISD-R. Circadian disorder - Shiftwork type: 11 participants met criteria for on the SWDI and 1 met criteria on the SCISD-R. Additionally on the SCISD-R, 5 participants met for hypersomnolence, 5 met for possible obstructive sleep apnea, and 1 met for possible narcolepsy. 6 participants endorsed an insomnia identity.
Conclusion: College student athletes endorse symptoms across a variety of sleep disorders. Differences in the number of participants who met criteria based on assessment measures versus the structured clinical interview indicate that alternate cutoff scores may be warranted for this population.
Support (if any): Pacific-12 Conference Student-Athlete Health and Well-Being Initiative Grant

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0989
EXAMINING THE RELATION BETWEEN ADHD SYMPTOMS AND POOR SLEEP QUALITY: THE ROLE OF HOUSEHOLD CHAOS AND SLEEP HYGIENE

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Introduction: When compared to typically developing youth, adolescents with ADHD exhibit greater sleep disturbances

(Becker et al., 2019). While research supports a link between ADHD and sleep disturbances, less is known about potential contextual mechanisms underlying this relation, and this gap hinders development of prevention and intervention efforts. Families of youth with ADHD are at higher risk of exhibiting poor sleep hygiene (Nikles et al., 2020) and of living in chaotic households, characterized by low structure, excessive noise, and instability (Agnew-Blais et al., 2022). Furthermore, sleep hygiene has mediated the relation between household chaos and adolescent sleep quality among those not assessed for ADHD (Billows et al., 2009). Therefore, we hypothesized that household chaos and sleep hygiene would sequentially mediate the relation between ADHD symptoms and sleep quality among adolescents.
Methods: A community sample of 259 mother-adolescent dyads (adolescent M age = 15.2 years; SD age = 1.18; 54.9% female) was recruited from across the United States via Facebook ads. Mothers rated adolescent ADHD symptom severity with the ADHD Rating Scale V (DuPaul et al., 1998). Adolescents completed the Pittsburg Sleep Quality Index (Buysse et al., 1989), Confusion, Hubbub and Order Scale (Matheny et al., 1995), and Adolescent Sleep Hygiene Scale (LeBourgeois et al., 2005).
Results: Utilizing structural equation modeling, we tested a model in which household chaos and sleep hygiene mediated the relation between ADHD symptoms and poor sleep quality after controlling for adolescent age and gender. All hypothesized direct pathways were significant and in the expected directions. Results examining indirect pathways indicated that the relation between ADHD symptoms and sleep quality was partially mediated through chaos ($\beta = 0.08$; $p = .001$), sleep hygiene ($\beta = 0.06$; $p = .036$), and sequentially mediated through chaos and sleep hygiene ($\beta = 0.04$; $p = .003$).
Conclusion: The results suggest that improving daily structure and stability of the household may not only improve sleep hygiene but may also help improve sleep in adolescents with ADHD symptoms. Furthermore, behavioral sleep interventions with components of sleep hygiene may benefit from targeting the routine and structure of the whole household rather than just the individual.
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0990

EXAMINING THE RELATIONSHIP BETWEEN SLEEP DURATION AND DEPRESSION

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Introduction: The full psychological effects of sleep on depression and anxiety are still being investigated. It has been hypothesized that genetic contributions to depressive symptoms increase at both short and long sleep durations. This study aims to see if there is a correlation between duration of sleep and depression and if sociodemographic factors affect this correlation.
Methods: A secondary dataset from National Health and Nutrition Examination Surveys conducted during 2015 – 2018 with 11,689 individuals was obtained. Questions were asked in the home by trained interviewers regarding sleep duration with the following questions "what time do you usually go to sleep on weekdays or workdays," "what time do you usually wake up on weekdays or workdays," and "how much sleep do you usually get at night on weekdays or workdays?" Depression was assessed with the standard PHQ-9 with 0-4 defined as minimal depression, 5-14 as moderate, and 15-27 as severe depression.
Results: The unadjusted data analysis showed that those with short sleep duration had 1.72 times higher likelihood for mild to moderate depression ($p < 0.001$) and 2.05 times higher likelihood for moderate to severe depression ($p < 0.001$). Those with long sleep duration had 1.54 times higher likelihood of mild to moderate depression ($p < 0.001$) and 2.01 times higher chance of moderate to severe depression ($p < 0.001$). When adjusted for the following variables: ethnicity, marital status, education, income, alcohol consumption, obesity, and smoking, those with short sleep duration had 1.63 times higher chance of mild to moderate depression ($p < 0.001$) and 1.84 times higher chance of moderate to severe depression ($p < 0.001$) and those with long sleep duration had 1.32 times higher likelihood of mild to moderate depression ($p < 0.001$) and 1.65 times higher chance of moderate to severe depression ($p = 0.002$).
Conclusion: These results confirm that any change to sleep duration, whether short or long, is correlated with increased rates of either moderate or severe depression. This study reflects correlation not causation therefore it is possible that sleep duration affects depression or vice versa. While there are many sociodemographic factors that can affect this correlation, the correlation persists when adjusting for these factors.
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0991

FEAR OF MISSING OUT AND SLEEP HEALTH: A SYSTEMATIC REVIEW AND META-ANALYSIS

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Introduction: Fear of missing out (FoMO) refers to anxiety and apprehension an individual feels when they believe they are missing out on rewarding experience, social interaction, or information. FoMO has been associated with negative psychological and behavioral symptoms and might also impact sleep health. This meta-analysis therefore aimed to examine the existing literature on the relationship between FoMO and dimensions of sleep health.
Methods: A systematic literature search across PubMed, PsycINFO, and Web of Science was conducted in August 2023. Primary inclusion criteria were original research studies that test the relationship between FoMO and a dimension of sleep health. Of the primary 268 studies identified, 16 were included in the final analysis.
Results: Meta-analytic results of the random-effects model applied to a total of 3 independent samples showed a positive correlation between FoMO and Bedtime Procrastination (Fisher's $Z = 0.250$; 95% CI 0.137, 0.362; $Z = 4.348$; $p < .001$). Additionally, meta-analytic results of the random-effects model applied to a total of 5 independent samples showed a positive correlation between FoMO and Sleep Hygiene (Fisher's $Z = 0.268$; 95% CI 0.186, 0.350; $Z = 6.419$; $p < .001$) and Sleep Quality (Fisher's $Z = 0.305$; 95% CI 0.038, 0.572; $Z = 2.240$; $p = 0.025$). Additionally, two or less independent samples showed positive significant relations between FoMO and insomnia, later lights out time, problematic sleep, sleep-deprivation, SOL and TST.

Conclusion: FoMO seems to be related to different dimensions of sleep health. It seems like the constant urge to stay connected or engaged can lead to sacrificing essential sleep hours, resulting in decreased sleep quality and procrastinated bedtime. This can have effects on various aspects of physical and mental health. Therefore, addressing FoMO may be relevant in improving sleep health. While our findings are significant, it's crucial to acknowledge the limitations of drawing conclusions from some of our results, which were based on findings from just one study. This highlights the need for further comprehensive research to establish a better understanding of the relationship between FoMO and sleep health. Future research should additionally focus on conducting longitudinal studies to understand the direction of the relationships better

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0992

HIPPOCAMPAL RESPONSE TO SLEEP SOUND MODERATES IMPACT OF DEPRESSED MOOD ON DAYTIME SLEEPINESS IN SHIFT WORKERS

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Introduction: Shift workers (SW) commonly experience mood symptoms, which is known to be linked to sleep disturbances and disrupted 24-hour rest-activity rhythm (RAR). Altered brain response to sleep-related sound (SS) were reported to be associated with dysfunctional appraisals of sleep and sleep disturbances. In current study, we aimed to investigate differences in brain activity in response to SS between SW and control participants (CON). Furthermore, we explored the moderation effects of brain response to SS on the relationships between daytime sleepiness, mood symptoms and 24-hour RAR in SW.
Methods: SW (n=57, female 75.4%) and CON (n=56, female 71.4%) completed questionnaires (Epworth Sleepiness Scale (ESS), Beck Depression Inventory (BDI), and Beck Anxiety Inventory). Participants also underwent one-night polysomnography and actigraphy with sleep diary for one week. We calculated 24-hour RAR with cosinor analysis on actigraphy parameters. Functional magnetic resonance imaging was performed while listening to SS and control sounds (CS). We compared brain activation in response to SS (vs. CS) between SW and CON. In addition, we conducted a moderation analysis with ESS as a dependent variable and BDI, BAI, and 24-hour RAR as independent variables. Brain activities with significant differences between SW and CON were used as moderators.
Results: SW showed higher ESS score ($t = 2.28$, $p = 0.025$) and lower interdaily stability, relative amplitude, and higher least active 5-hour period (all-ps < 0.001). SW also showed higher activity to SS in right hippocampus ($t = 3.61$, $p < 0.001$) and MFG ($t = 3.57$, $p < 0.001$) compared to CON. In SW, right hippocampus activity (HA) in response to SS moderated the relationship between BDI and ESS ($F = 7.61$, adjusted R-squared $= 0.265$, $p < 0.001$, high HA; $r = 0.433$, low HA; $r = 0.051$).
Conclusion: Current results suggested differential brain activity to sleep-related stimuli in SW. Moreover, the findings indicate that decreased right HA in SW can be associated with increased impact of depression on daytime sleepiness. Therefore, modulating HA and managing depressive symptoms can be helpful in reduction in excessive daytime sleepiness among SW.
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0993

IMPAIRED EXECUTIVE FUNCTIONING IS LINKED TO SUICIDALITY IN YOUTH WITH INSOMNIA DISORDER

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Introduction: Suicide, a critical global mental health issue, has been linked to sleep difficulties. Previous studies have also found that psychological distress and negative thinking styles could contribute to a higher risk of suicide. While cognitive deficit is one of the most common complaints among individuals with insomnia, its impact on suicidality in the context of insomnia has seldom been investigated. The current study aimed to investigate the relationship between executive functioning and suicidality among youth with insomnia.
Methods: Adolescents with DSM-5 insomnia disorder were recruited from local schools, universities, and the community in Hong Kong. Eligible participants completed self-reported measures, including Depressive Symptom Index - Suicidality Subscale (DSISS), Hospital Anxiety and Depression Scale (HADS), Insomnia Severity Index (ISI), Ruminative Response Scale (RRS), and were administered Wisconsin Card Sorting Test (WCST). The total scores of HADS were used to indicate psychological distress. Failure to maintain set (FMS) from WCST was used to indicate distractibility, an aspect of executive function, with higher scores suggesting greater distractibility.
Results: A total of 115 adolescents with insomnia disorder (Age: 18.34 ± 1.56, 14-20, female: 65.22%) were recruited. Multivariate regressions revealed that higher HADS ($b=0.06$, $p=.045$), RRS ($b=0.05$, $p<.001$), and FMS ($b=0.30$, $p=.035$) scores were all significantly associated with DSISS. The results remained significant after controlling for insomnia severity, gender, and age.
Conclusion: Our findings showed a link between impaired executive functioning, specifically distractibility, and suicidality. Distractibility may be attributed to the reduced suppression of the default mode network, which is associated with depression and rumination, thereby increasing the risk for suicidality. Future neuroimaging research is needed to further explore the underlying mechanism of such associations.
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0994

LEGAL CONSIDERATIONS FOR SLEEP AND MENTAL HEALTH: A REVIEW OF FOSTER CARE BEDROOM GUIDELINES AMONG 50 U.S. STATES

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Introduction: Each year, the foster care system provides out-of-home placement for over 400,000 children, who are temporarily or permanently separated from their families. The prevalence of sleep and mental health problems in this population is well-documented. Persistent sleep problems associated with past and ongoing trauma independently elevate long-term risk for a host of physical and psychiatric disorders. While federal laws provide universal requirements for safe foster placements, the extent to which individual state laws and guidelines address child sleep health and environments varies. The aim of this policy review of administrative codes and guidelines regarding sleep/bedroom arrangements for children in foster care in all 50 U.S. states was to document that variability and examine whether state regulations incorporate sleep research findings.
Methods: Applicable bedroom and bed sharing guidelines were retrieved from each state's government websites, followed by coding, categorization, and a systematic review. Categories included 7 broad themes: Bed Sharing, Room Sharing, Space Requirements, Bed Requirements, Caregiver-Child Requirements, Health, and Miscellaneous.
Results: While 39 states (78%) required an individual bed for each child in care, specific guidelines regarding bed and bedroom sharing with other children varied greatly by state. There was an even distribution across states that allowed bed or bedroom sharing for siblings (50%) and those that did not address this topic (50%), but only 6 states stated the importance of keeping sibling groups together when determining appropriate sleeping arrangements. In addition, a few states mentioned history of neglect, abuse, and trauma as factors to consider for sleep/bedroom guidelines. Only 10 states (20%) allowed bedroom sharing with a caregiver during emergencies, such as illness or periods of emotional distress.
Conclusion: Despite the universal importance of healthy sleep for all aspects of child development, we found striking differences between states regarding rules and guidelines for sleep and bedroom sharing. Most requirements lack consideration of children's potential history of abuse and trauma, which contribute to sleep problems in this population. Also concerning is the lack of clear regulations regarding caregiver intervention in case of emergencies. We urge policymakers to reconsider current guidelines in accordance with sleep research and evidence-based practices.
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0995

MENTAL HEALTH AND SUBSTANCE USE OUTCOMES ASSOCIATED WITH USE OF CANNABIS AS A SLEEP AID: A CO-TWIN CONTROL STUDY

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Introduction: Using cannabis as a sleep aid is common. However, little is known about how this practice relates to mental health and substance use. To address this, we examined associations between using cannabis as a sleep aid with mental health and substance use outcomes using a co-twin control design.
Methods: Participants were 3,165 adults (Mage=36.7 (SD=5.3)) from two population-based twin cohorts. Outcomes of interest included mental health constructs (e.g. depression, impulsivity), substance use measures (frequency and problems from use of specific substances), and use of other substances for sleep. First, we conducted regression models to test phenotypic associations between endorsing past month use of cannabis to aid sleep (yes/no) and the above outcomes. Next, we used multilevel models to examine whether significant phenotypic associations were due to between-family effects (genetic and environmental factors shared by co-twins) or within-twin pair effects (genetic and environmental factors which differ between co-twins). All analyses controlled for sleep quality and cannabis frequency.
Results: The sample was 56.7% monozygotic twins, 39.6% male, and 92.7% Caucasian. Phenotypic associations were significant between endorsement of using cannabis for sleep and most outcomes. All significant associations were in the direction of worse mental health, greater use of other substances for sleep, and greater frequency of, and problems from, substance use. All significant phenotypic effects remained significant at the between-family level, but not all remained significant at the within-family level. At the within-family level, the twin who endorsed using cannabis as a sleep aid (vs. their co-twin who did not) reported more frequent use of alcohol (B=0.44, p<.001) and medication (B=0.26, p=.022) for sleep, greater frequency of alcohol use (B=13.0, p=.018), and more problems from cannabis use (B=0.85, p=.007).
Conclusion: Associations between using cannabis for sleep with worse mental health, after controlling for sleep quality and cannabis frequency, are likely due to shared genetic and/or environmental factors. Associations with substance use measures that were not accounted for by shared genetic and/or environmental factors include greater alcohol use frequency, more problems from cannabis use, and more frequent use of other substances for sleep.
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0996

PARENTAL SLEEP DISTURBANCE AND ITS IMPACT ON CHILDHOOD MEDICATION ADHERENCE

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Introduction: Childhood medication adherence is paramount in treating both acute and chronic medical conditions. Sleep disturbances in children and adults have been linked to cognitive performance, cardiovascular function, immune regulation and behavioral disturbances. Despite documented interactions between concomitant parental substance use, depressive symptoms, and financial strain with sleep, there is limited data on how parental sleep disturbances impact childhood medication adherence.
Methods: Data was extracted from a mTURK dataset with 740 participants who were 18 years and older with at least one child who had been prescribed a medication within the prior three months. Parental sleep was measured using the PHQ-9 with a scale of 0 for "no trouble", 1 for "several days", 2 for "more than half of the days", or 3 for "nearly all the days". The Adverse Childhood Experiences (ACE) scale was used to determine

a total ACE score (0-10). Children medication adherence was measured based on the following questions, "How often has your child followed his/her medical treatment instructions in the past three months?" and "How often has your child taken medication as prescribed in the past three months?" Responses were coded as "Adherent" if parents responded "Always" to both questions, but were otherwise coded as non-adherent. Statistical analysis was performed using RStudio software. Logistic regression analysis and Pearson's correlation coefficient were used to test association between variables.
Results: We found a statistically significant relationship between the parental response to the sleep question on the PHQ-9 and the parent's report of child's adherence to medication. For every point increase in PHQ-3, the odds of having high adherence to a child's medication decreased by 17%, when controlling for parental gender, chronic disease status, and parental ACE status ($p < 0.05$). There was also a weak positive correlation (0.19) with higher parental ACE score and sleep difficulties as measured by the PHQ-9.
Conclusion: There is a positive correlation between parental sleep disturbances and childhood medication adherence; this is a potential area for therapeutic intervention.
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0997

PRELIMINARY ANALYSES OF SLEEP AND PSYCHOTIC-LIKE EXPERIENCES IN A CLINICAL HIGH-RISK SAMPLE

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Introduction: While sleep disturbances are common in individuals with psychotic disorders, and are shown to exacerbate symptoms and cognitive deficits, less is known about sleep in youth at heightened clinical high risk (CHR) for psychosis. The goals of the present study were to identify CHR individuals using well-established clinical criteria, quantify sleep using wearable technology, and investigate the relations between objective measures of sleep with endorsed psychotic-like experiences (PLEs) and associated distress.
Methods: Participants were recruited from the Psychosis-risk Intervention, Education, and Research (PIER) Program. While data collection is ongoing for this longitudinal study, current analyses were based on 9 participants (67% female, 11% male, 22% non-binary, ages 13-33). Self-reports on the Prodromal Questionnaire-Brief were used to quantify PLEs and associated distress. Sleep was measured at home with an EEG headband (Sleep Profiler) and scored according to standard AASM criteria.
Results: Preliminary analyses reveal great variability in sleep efficiency (56-97%) and Wake After Sleep Onset (5-101 min). Contrary to our predictions, we observed no significant relations between sleep duration, efficiency, or architecture and PLEs (all p's >.5).
Conclusion: In this group of help-seeking individuals we did not observe significant relations between sleep indices and self-reported PLEs. The current study has several limitations such as a small sample size and clinical heterogeneity, and relied on self-reported measures of PLEs completed by participants online. With data collection still under way, future plans include obtaining objective clinical phenotypes (e.g., utilizing the Structured Interview of Psychosis-risk Syndromes to categorize clinical high risk status) and investigating how sleep and PLEs change over time.
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0998

SLEEPING IT OFF: ALCOHOL, CANNABIS, AND ALTERATIONS IN BEDTIME AND WAKETIME IN WOMEN WITH SLEEP AND PAIN COMPLAINTS

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Introduction: Alcohol and cannabis are among the most used psychoactive substances. Many people use alcohol and cannabis with the belief that they will promote sleep, but both substances are linked to sleep problems. However, the relationships between alcohol and cannabis consumption and fluctuations in circadian rhythm are less clear. Hence, we examined the intraindividual associations between alcohol and cannabis consumption on a given day and subsequent deviations from typical bedtime and waketime.
Methods: Two hundred and fifty-one adults with sleep and pain complaints (Mage = 42.14 yrs, SD = 13.75 yrs, range = 18-81 yrs, 100% female) completed two weeks of daily sleep diaries. Mean bedtimes and waketimes were calculated in minutes, and daily calculations were performed to determine one's daily deviation from mean bedtime and waketime. Multi-level models examined associations between the number of alcoholic drinks per day, the number of times consuming cannabis per day, and daily deviation from mean bedtime and waketime. Analyses controlled for daily usage of sleep medications (yes/no) and weekends (yes/no).
Results: Greater numbers of alcoholic drinks on a given day were associated with later waketimes on the following day (B = -8.15, SE = 1.77, p <.001), and greater numbers of alcoholic drinks were trending significance (p = .07) with daily deviation in bedtime. In context, every additional drink for an individual on a given day was associated with a nearly 8-minute delay in that individual's waketime on the following morning. Number of times using cannabis was not associated with deviations from typical bedtime (p = .80) nor waketime (p = .90).
Conclusion: Our daily level analyses conducted in a large sample of women suggest that more alcoholic drinks on a given night are linked to later waketimes. Results are dose dependent such that heavier drinking is linked to a larger shift in waketimes (5 drinks = 40 minutes) relative to lighter drinking (1 drink = 8 minutes). Future research could include experimental techniques like alcohol administration and polysomnography to better understand the relationship between alcohol and circadian rhythm.
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0999

STRESS, SLEEP DISTURBANCES AND COPING STRATEGIES AMONG TAIWANESE PRIMARY FAMILY CAREGIVERS IN INTENSIVE CARE UNITS

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Introduction: The primary family caregivers in the intensive care unit (ICU) often experience stress and sleep disturbances. Exploring coping strategies for these caregivers is crucial for preventing burnout and alleviating adverse psychological and health outcomes. This study aimed to examine stress, sleep disturbances, and coping strategies among primary family caregivers in the ICU.
Methods: Data were extracted from the baseline assessment of an ongoing pilot experimental study conducted in four adult ICUs in a teaching hospital in central Taiwan. Eligible participants were (1) unpaid primary family caregivers acknowledged by either patients or their family members and (2) individuals with a family member who underwent mechanical ventilation for more than 48 hours while in the ICU. Participants completed a set of study questionnaires, including the Impact of Events Scale-Revised (IES-R), General Sleep Disturbance Scale (GSDS), Brief COPE, and Multidimensional Scale of Perceived Social Support (MSPSS).
Results: Eight primary family caregivers were recruited from 12 November 2023 to 8 December 2023. The mean age of these caregivers was 55.5±10.17 years, and 3 (37.5%) of them were female. The primary family caregivers experienced high stress levels (mean IES-R score > 32), sleep disturbance (mean GSDS score > 3), and poor sleep quality (mean subscale score of GSDS > 3). The primary family caregivers most often used acceptance, active coping, and positive reframing strategies to manage stress, and they received more social support from their families than from friends. Those caregivers who perceived higher stress levels reported more sleep disturbances ($rs = .74$, $p < .05$) and poorer sleep quantity ($rs = .95$, $p < .05$). They also relied more on self-distraction ($rs = .79$, $p < .05$), emotional support ($rs = .76$, $p < .05$) and planning coping to manage stress ($rs = .77$, $p < .05$).
Conclusion: The results of this ongoing study showed that primary family caregivers in the ICU experienced heightened stress perception and sleep disturbance. Future studies should focus on exploring effective coping strategies to help primary family caregivers in the ICU to manage stress.
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1000
THE ASSOCIATION BETWEEN SLEEP PROBLEMS AND SELF-RATED PSYCHOTIC EXPERIENCES

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Introduction: Schizophrenia spectrum and other psychotic disorders are associated with a wide variety of functional impairments that interfere with daily functioning. Sleep is one domain that is disturbed in almost 80% of people experiencing schizophrenia and similar symptoms. We hypothesized that self-reported sleep disturbances would significantly predict tendencies consistent with schizophrenia and its associated subdomains—psychotic experiences, social detachment, and thought disorder symptoms. Social detachment and thought disorder symptoms are transdiagnostic traits that span many psychopathologies. We further hypothesized that each subdomain may be differentially associated with unique types of sleep disturbances.
Methods: Our sample comprised 190 participants with a mean age of 25 years old (SD=6.81) and a sex ratio of 71 males to 119 females. Each participant completed the Personality Assessment Inventory (PAI) to assess aspects of mental health consistent with schizophrenia spectrum disorders and the Pittsburgh Sleep Quality Index (PSQI) to assess sleep disturbances according to seven facets: subjective sleep quality, latency, duration, efficiency, disturbance, sleep medication use, and daytime dysfunction (DD). We used a stepwise linear regression to predict schizophrenia domain severity from sleep problems. Bivariate correlations were run to clarify the associations between schizophrenia and sleep disturbance subdomains.
Results: When considered in combination, self-reported DD was the only significant predictor of schizophrenic domain severity ($\beta=.489$, $p<.001$; $R^2=.239$: $F(1)=54.874$, $p<.001$). Individually, the psychotic experiences domain was correlated with DD ($r=.230$, $p=.002$) and sleep disturbances ($r=.201$, $p=.007$). Self-reported thought disorder traits were significantly related to sleep disturbances ($r=.254$, $p<.001$), DD ($r=.491$, $p<.001$), sleep medication use ($r=.178$, $p=.016$), and subjective sleep quality ($r=.312$, $p<.001$). Social detachment was correlated with DD ($r=.322$, $p<.001$) and sleep efficiency ($r=-.162$, $p=.030$).
Conclusion: Sleep-related daytime impairment predicted greater severity on the schizophrenia scale of the PAI and was associated with all related subdomains. Additionally, each of the subdomains were correlated with sleep disturbances, which could reflect the hyperarousal found with positive symptoms disturbing sleep maintenance. Sleep related interventions could contribute to reducing schizophrenia symptom severity. As hypothesized, specific sleep disturbance facets were differentially associated with schizophrenia subdomains. Each of these sleep facets may serve as important therapeutic targets in minimizing symptom severity in schizophrenia spectrum disorders.
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1001
THE ROLE OF NEUROBEHAVIORAL SYMPTOMS IN THE RELATIONSHIP BETWEEN INSOMNIA SEVERITY AND SLEEP QUALITY

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Introduction: Sleep disturbance is a common symptom following head trauma. About half of those who have suffered head trauma will experience disruptions in sleep. Further, moderate to severe traumatic brain injuries (TBIs) may increase the risk for frontotemporal lobe damage, contributing to cognitive impairments. Additionally, addressing problems related to TBI among emerging adults are warranted given that brain structural maturation may be accompanied by emotional, behavioral, and cognitive changes, including changes in sleep. This study examined the role of neurobehavioral symptoms in the relationship between insomnia severity and sleep quality.

Methods: Data were obtained from adults (N=151; Mean age=24.71 (SD=9.9); 75.5% Female) who completed self-report measures. The Neurobehavioral Symptom Inventory (NSI) was used to evaluate symptoms commonly associated with post-concussion syndrome that may emerge after a mild TBI. The Insomnia Severity Index assessed for the nature, severity, and impact of insomnia symptoms with higher scores indicating greater symptom severity. The Pittsburgh Sleep Quality Index assessed for sleep quality, and disturbance, with lower scores indicating better sleep quality. All statistical analyses were conducted using IBM SPSS version 29, along with Hayes PROCESS macro for mediation analyses.

Results: Significant correlations were found between insomnia severity and neurobehavioral symptoms ($r=.537$, $p<.001$). Data also showed positive associations between sleep quality and insomnia severity ($r=.681$, $p<.001$) and neurobehavioral symptoms ($r=.587$, $p<.001$), respectively. There was a significant total effect between insomnia severity and sleep quality ($B=.507$, $p<.001$), and path a ($B=1.26$, $p<.001$) and path b ($B=.099$, $p<.001$) were both significant. Finally, when neurobehavioral symptoms entered the relationship between insomnia severity and sleep quality, the direct effect ($B=.383$, $p<.001$) was significant. The bias corrected 95% CI was .124 and CI 95% = .067 to .192 which excluded zero. Thus, neurobehavioral symptoms are considered a mediator for insomnia severity on sleep quality.

Conclusion: These findings suggest that neurobehavioral symptoms are associated with both sleep disturbance and sleep quality. The impact of neurobehavioral symptoms appeared to be indirectly due to the effects of sleep disturbance on poor sleep quality. These results suggest that while sleep-focused interventions may be warranted, it is anticipated that improved sleep may result in improved neurobehavioral outcomes.

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1002

HEART RATE VARIABILITY DURING SLEEP AND FUTURE RISK OF PARKINSON'S DISEASE IN COMMUNITY-DWELLING OLDER MEN

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Introduction: Autonomic dysfunction is common in early stages of Parkinson's disease (PD), providing an opportunity for early diagnosis and disease prediction. However, little is known about the longitudinal association between overnight—and sleep stage specific—heart rate variability (HRV), a marker of autonomic function, and incident PD.

Methods: Our sample consisted of 2470 older men (mean [SD] age = 76.1 [5.4] years) without PD who underwent polysomnography between 2003 and 2005 and were followed until 2016 for incident self-reported PD as part of the Osteoporotic Fractures in Men (MrOS) prospective study. HRV was calculated from the electrocardiogram in 5-minute epochs across the whole night and during rapid eye movement (REM) sleep and non-REM stages N2 and N3 (N2N3) alone. HRV metrics included measures of overall HRV (SDNN, standard deviation of NN intervals), short-term HRV/parasympathetic influence (RMSSD, root mean square of successive NN interval differences; HF, high frequency power), long-term HRV/sympathetic, parasympathetic, and baroreflex influence (LF, low frequency power), and long-term to short-term HRV balance (LF/HF; LFnu, normalized LF power, LF/[HF+LF]), which may represent sympatho-vagal balance. Associations between tertiles of HRV metrics and incident PD were assessed using multivariable logistic regression.

Results: During 11 years of follow-up, 60 incident PD cases were identified. After adjustment for covariates including age and comorbidities, men in the lowest tertile of LFnu measured across the whole night [OR (95% CI) = 2.13 (1.09,4.35)] and during REM alone [OR (95% CI) = 2.44 (1.23,5.55)] had approximately twice the odds of developing PD compared to those in the highest tertile. Results were similar for LF/HF, though the association was only significant during REM [OR (95% CI) = 2.33 (1.08,5.55)]. Further adjustment for apnea-hypopnea index did not attenuate these associations. HRV metrics assessed during N2N3 were not associated with incident PD, nor were SDNN, RMSSD, HF, and LF.

Conclusion: Individuals with decreased long-term to short-term HRV balance (possibly representing low sympatho-vagal balance) had higher risk of developing PD. REM may be a particularly important sleep stage for measurement of autonomic dysfunction in early PD and assessment of future PD risk.

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1003

DAILY MORNING BLUE LIGHT EXPOSURE FOR ALERTNESS AND SLEEP FOLLOWING STROKE

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Introduction: In the acute phase following a stroke, circadian rhythmicity is often disrupted, which undermines sleep, produces fatigue, and impedes recovery. Studies have reported post-stroke sleep architecture abnormalities, as well as acute sleep disorders which can range between extremes of clinically significant insomnia to hypersomnia, with sleep complaints sometimes persisting for months or years. Morning blue light exposure as an early, non-pharmacologic intervention targeted for strengthening circadian rhythmicity could provide acute relief and prevent disordered sleep from becoming chronic following stroke.

Methods: A randomized, single-blind, parallel group, placebo-controlled pilot study compared daily morning exposure to blue light or red light (placebo) for improving daytime sleepiness, fatigue, nocturnal sleep, and cognition in patients receiving inpatient rehabilitation for acute stroke. N=43 patients with disordered sleep secondary to first episode stroke (n=34 ischemic, n=9 hemorrhagic; ages 66.2±14.1y) were randomized to receive 25min of morning blue or red light for 5 or more days depending on inpatient rehabilitation length of stay (blue n=21, red n=22). At baseline and study discharge, daytime sleepiness was measured with the Karolinska Sleepiness Scale and Wits Pictorial Sleepiness Scale, fatigue with a visual analogue scale, and cognitive function with the Rey Auditory Verbal Learning Test and Trail Making Test (TMT). Actigraphy measured sleep continuously throughout participation with nighttime sleep defined as 21:00–05:59. Effect sizes per outcome were used to estimate sample sizes for larger follow-up studies.

Results: Participants with blue light exposure experienced significant improvements in daytime sleepiness, fatigue, and auditory verbal learning (all $p<.05$) relative to red light exposure. There was a trend toward a greater mean duration of nighttime sleep ($p=.076$) and fewer awakenings after sleep onset ($p=.092$) in the blue light compared to red light group. Although change in TMT and nocturnal sleep parameters did not reach statistical significance, effect sizes favored blue-light exposure, ranging from .38–.57.

Conclusion: Morning blue light exposure for 5 or more days led to greater improvements in daytime sleepiness, fatigue, and cognitive outcomes than red light exposure after acute stroke. Effect sizes suggest a larger study is warranted to confirm generalizability of pilot findings.

Support (if any): Empire Health Foundation

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1004

PREDICTING INCIDENT PARKINSON'S DISEASE AND DEMENTIA WITH LEWY BODIES FROM NOCTURNAL WRIST ACTIGRAPHY

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Introduction: "Isolated" REM sleep behavior disorder (iRBD) is an early marker of Parkinson's disease (PD) and dementia with Lewy bodies (DLB) that affects 1-2% of individuals after 60 years of age. We published on a classifier using nocturnal wrist actigraphy data which achieved >90% accuracy for iRBD detection. Here, we applied the same iRBD classifier in a population sample, the UK Biobank data to predict risk of incident PD or DLB.
Methods: 30,000 records were randomly selected from the United Kingdom Biobank (UKBB) cohort dataset and were included based on age>60 years, no neurological diagnosis and >3-day valid nocturnal actigraphy data. Our published models were used to generate an iRBD score through automated detection of sleep periods and movement features from the accelerometer data. The iRBD score was generated for all the subjects and divided into: top 1%tile (predicted iRBD) and bottom 90%tile (predicted no-iRBD). The outcomes of interest were: 1) PD; 2) possible DLB. Odds ratio were then calculated using the iRBD scores (predictor) and the outcomes of interest (1 or 2).
Results: In the 10,087 records that met inclusion criteria, mean age was 63.8±2.8 years and subjects had on average 6.4±0.9 nights of valid actigraphy data. 109 subjects developed PD, and 67 DLB after 5.1±2.1 years. In the top 1%tile (n=101), 10 of 109 incident PD, and 18 of 67 DLB were accurately predicted by the calculated iRBD scores (sensitivity 9.2% and 26.8%, respectively). In the bottom 90%tile (n=9,078), 8,952 were accurately predicted to not develop PD or DLB (specificity 98.6%). Odds ratio were 9.1 [4.0 – 20.1] for PD, 40.2 [21.3 – 75.7] for DLB, and 19.8 [11.9 – 32.76] for either PD or DLB.
Conclusion: These results provide proof of concept that the existing iRBD detection model can be used to predict neurodegenerative outcomes in the community setting using ≥3 nights of actigraphy data. Future studies may assess additional actigraphy features related to 24h rest-activity rhythms (RAR) and gait patterns.
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1005

IMPROVED SLEEP APNEA SCREENING AFTER STROKE USING MULTIMODAL WEARABLE SENSORS AND MACHINE LEARNING

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Introduction: Sleep apnea affects over half of stroke survivors, impacting post-stroke recovery and outcomes. Early intervention through continuous positive airway pressure (CPAP) can reduce the impact of sleep apnea, motivating the need for accurate sleep apnea screening tools. Current screening tools such as home sleep apnea tests (HSATs) are difficult to use and uncomfortable due to bulky acquisition systems, electrodes, straps, and/or nasal cannulas, whereas questionnaires (i.e., STOP, STOP-BANG, Berlin OSA) suffer from lack of reliability and low sensitivity. Wireless, multimodal wearable sensors are promising tools to address these gaps; however, stroke-specific algorithms are essential to account for post-stroke physiological changes. The objective of this study was to develop and validate an apnea screening system using wearable sensors and machine learning during early stroke recovery.
Methods: Patients wore an HSAT (ApneaLink Air) and the Advanced NeoNatal Epidermal (ANNE) Chest and Limb sensors for one night within a week of admission to an acute rehabilitation facility. ANNE sensors are flexible, light-weight (< 17 grams), adhesive based sensors capable of continuous monitoring (up to 7 days). Sleep-based features derived from physiological signals were extracted from ANNE sensors and paired with the ground truth apnea indication from the ApneaLink Air. A logistic regression machine learning model was trained to classify no apnea (normal, AHI< 5) from apnea (mild, moderate, severe, AHI≥5).
Results: Forty-seven patients were screened with ApneaLink; over 60% had sleep apnea. Models using data from the ANNE Limb sensor performed best, with an F1 score (F1=0.75) outperforming the STOP (F1=0.62), STOP-BANG (F1=0.63), Berlin-OSA (F1=0.62) and a naive classifier (F1=0.38). Model performance increased when distinguishing between AHI< 5 versus AHI≥15 (F1=0.94), whereas the surveys and naive classifier (F1=0.67, F1=0.58, F1=0.58, F1=0.33, respectively) saw a decline in performance.
Conclusion: Wearable sensors and stroke-specific machine learning models outperformed traditional questionnaires for sleep apnea screening, approaching HSAT-level accuracy (ApneaLink Air). The accessibility, comfort, and ease of use of sensors are well-suited for early application and continuous sleep monitoring compared to commercial HSAT devices.
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1006

EFFECT OF OBSTRUCTIVE SLEEP APNEA ON THE LONGITUDINAL CHANGE IN THE GLYMPHATIC SYSTEM FUNCTION

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Introduction: Glymphatic cerebral waste-clearance system is activated during sleep, and obstructive sleep apnea (OSA) might have impact on the long-term disruption of the glymphatic system function and the development of neurodegenerative diseases. This study investigated the longitudinal association of OSA with changes in glymphatic system function and cognitive function domains.
Methods: Based on a community-based prospective cohort, participants who had both baseline and 4-year follow-up polysomnography, brain MRI with diffusion tensor imaging (DTI), and comprehensive cognitive assessment data were included. At both baseline and follow-up, participants were categorized as non-OSA (apnea-hypopnea index, AHI < 5), mild OSA (5≤AHI< 15), and moderate-to-severe OSA (AHI≥15) groups. According

to the longitudinal change in the OSA severity, participants were categorized as OSA-free (non-OSA at both baseline and follow-up), improved OSA, stationary OSA, and progressed OSA groups. Glymphatic system function was measured using DTI analysis along the perivascular space (DTI-ALPS) index.
Results: 1,110 participants (mean [SD] age, 58.0 [6.0] years; 517 [46.6%] men) were included in the final analysis. At baseline, 621 participants were categorized as non-OSA, 338 participants as mild OSA, and remaining 151 participants as moderate-to-severe OSA. At follow-up, 458 participants were categorized as OSA-free, 114 participants as improved OSA, 303 participants as stationary OSA, and 235 participants as progressed OSA. At baseline, non-OSA group exhibited higher DTI-ALPS index compared to the remaining groups (both, P< 0.001) and AHI was inversely correlated with DTI-ALPS index (R=-0.169, P< 0.001). At follow-up, the change in the DTI-ALPS index (ΔDTI-ALPS) was the highest in the improved OSA group, followed by the OSA free, stationary OSA, and progressed OSA groups. ΔDTI-ALPS over 4-year was inversely correlated with ΔAHI (R=-0.171, P< 0.001 for the entire study population and R=-0.218, P< 0.001 for the population excluding OSA-free subgroup). ΔDTI-ALPS over 4-year was correlated with the changes in the visual reproduction–immediate recall (R=0.233), delayed recall (R=0.178), and recognition (R=0.188) scores (all, P< 0.001).
Conclusion: The changes in the OSA status has impact on the longitudinal change in the glymphatic system function and this effect might be reversible. Sustained proper management of OSA might be important in the effective prevention and management of cognitive decline.
Support (if any):

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1007

SOLRIAMFETOL ON COGNITION IN OBSTRUCTIVE SLEEP APNEA WITH EXCESSIVE DAYTIME SLEEPINESS AND IMPAIRED COGNITION

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Introduction: Cognitive impairment is a burdensome symptom in many patients with excessive daytime sleepiness (EDS) associated with obstructive sleep apnea (OSA). Solriamfetol (Sunosi®) is a dopamine/norepinephrine reuptake inhibitor, with agonistic properties at TAAR1 and serotonin 1A receptors, approved to treat EDS associated with OSA (37.5–150 mg/day). We evaluated the effect of solriamfetol on subjective cognitive function by examining overall scores and individual cognitive complaint and functional items of the British Columbia-Cognitive Complaints Inventory (BC-CCI).
Methods: SHARP was a randomized, double-blind, placebo-controlled, crossover trial in participants with impaired cognition associated with OSA and EDS. Participants received solriamfetol for 2 weeks (75 mg for 3 days, then 150 mg/day), and placebo for 2 weeks, separated by a 1-week wash out. Items of the BC-CCI included forgetfulness/memory problems, slow thinking speed, trouble expressing thoughts, trouble finding the right word, poor concentration, trouble figuring things out, and vocational, family/friends, and social/recreational functioning. Mixed models with repeated measures were used to examine differences in changes from baseline between placebo and solriamfetol.
Results: The SHARP study enrolled 59 participants (ages 52.2±10.7y; 36% female). Baseline overall BC-CCI scores were 11.4±2.5 (mean±SD); scores were comparable in participants randomized to the solriamfetol/placebo (n=30; mean=11.4) versus placebo/solriamfetol (n=29; mean=11.4) crossover sequences. Overall BC-CCI scores showed greater reduction from baseline (ie, more improvement in subjective cognitive function) after solriamfetol compared with place bo (P=0.002; Cohen's d=0.45). Baseline scores on individual BC-CCI items were generally similar for participants randomized to solriamfetol/placebo versus placebo/solriamfetol. Solriamfetol led to greater reductions from baseline compared with placebo in poor concentration (P=0.007; d=0.37), slow thinking speed (P=0.009; d=0.36), trouble finding the right word (P=0.042; d=0.28), trouble figuring things out (P=0.030; d=0.30), and forgetfulness/memory problems (P=0.013; d=0.34). Trouble expressing thoughts approached significance (P=0.077; d=0.24). No significant differences were found for vocational, family/friends, and social/recreational functioning (P>0.05).
Conclusion: Consistent with previous reports showing improvement on objective cognitive measures, solriamfetol led to significant subjective improvements overall, and particularly in subjective cognitive domains that may be related to memory, executive functioning, and processing speed. Solriamfetol can improve subjective cognitive functioning in participants with impaired cognition associated with OSA and EDS.
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1008

DAYTIME SLEEPINESS IS ASSOCIATED WITH INCREASED CEREBROSPINAL FLUID TAU PROTEINS IN ALZHEIMER'S DISEASE

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Introduction: Sleep disturbance increases Alzheimer's disease (AD) biomarkers, but it remains unclear whether the magnitiude of this effect differs by cognitive status. Addressing this unknown will elucidate when it is most critical to intervene to moderate AD pathophysiology and slow or arrest clinical progression.
Methods: A total of 155 participants, enrolled in Alzheimer Disease Research Center studies at University of California, Irvine (mean age 72.34 ± 7.07 years, 60.0% female) completed subjective assessment of sleep and cerebrospinal fluid (CSF) collection. Participants were divided into four cognitive status groups (Cognitively Normal, n=89; Questionable Cognitive Impairment, n=19; Mild Cognitive Impairment, n=33; and mild to moderately severe AD dementia, n=14). The Medical Outcomes Study Sleep Scale (MOS-SS) subscales assessed multiple sleep domains: Sleep Disturbance, Sleep Adequacy, Sleep Somnolence, Sleep Problems Index I, and Sleep Problems Index II. CSF biomarkers included β-amyloid 42 (Aβ42),

total tau (t-tau), and phosphorylated tau (p-tau181). Moderation by cognitive status on the relationships among sleep scores and CSF biomarkers was assessed using the PROCESS macro in SPSS, adjusting for age and sex. Moderation by sleep scores in the cognitive status-CSF biomarkers relationship was also tested.
Results: After adjusting for age and sex, moderation analyses revealed significant interactions between sleep somnolence and cognitive status on CSF t-tau (F=3.3, p=0.023) and p-tau181 (F=2.9, p=0.035) but not Aβ42 (F=0.057, p=0.98) protein levels. The associations between sleep somnolence and t-tau (B = 4.18, SE = 1.51, t = 2.76, p = 0.01) and p-tau181 (B = 0.50, SE = 0.18, t = 2.69, p = 0.01) were positive and stronger in the AD group in comparison to all other cognitive status groups (all p>0.35).
Conclusion: These findings indicate that in AD patients, greater subjective daytime sleepiness is associated with higher levels of t-tau and p-tau181 protein levels. As tau proteins are associated with neurodegeneration and cognitive decline, daytime sleepiness, whether or not due to the presence of sleep disorders such as sleep apnea, may be a risk factor or indicator of symptomatic progression of dementia in AD. Future studies should explore the efficacy of sleep-based interventions in slowing AD dementia progression.
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1009

ASSOCIATION OF CIRCADIAN RHYTHM WITH 27-HYDROXYCHOLESTEROL IN AMNESTIC MILD COGNITIVE IMPAIRMENT (AMCI) PATIENTS

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Introduction: The 27-hydroxycholesterol(27-OH) has been proposed as a factor mediating the risk of Alzheimer's disease(AD) through oxidative cholesterol metabolism associated with cognitive impairment. Meanwhile, circadian disturbance has been implicated in accelerated aging and incident dementia, mediating metabolic dysregulation, which may lead to neurodegenerative diseases like AD. However, the relationship between circadian rhythm and cholesterol metabolism in MCI is poorly understood. We aimed to compare circadian parameters between amnestic MCI(aMCI) patients and normal controls(NC), and to examine whether changes in circadian parameters can be related with 27-OH levels.
Methods: Participants over 50 years were recruited from the Memory Clinic at Kangwon National University Hospital, and two public Dementia Care Centers. The diagnosis of aMCI was made according to Petersen's criteria. Actigraphy monitoring was conducted at home for five days. Nonparametric variables including the inter-daily stability(IS), intra-daily variability(IV) and relative amplitude(RA) were calculated for rest-activity rhythm(RAR) and light exposure rhythm(LER), respectively. DLMO was determined from five hourly saliva samples obtained before sleep onset. The 27-OH levels were measured using high performance liquid chromatography/mass spectrometry(H-PLC/MS). Eighteen aMCI patients(76.6 ±6.1 years) and 21 NCs(70.4±6.7years) were finally analyzed. Generalized linear models(GLMs) were used to assess the main effects of circadian parameters on 27-OH levels and their interactions with group.
Results: There were no significant differences in the RAR and LER variables(IV, IS and RA), and the DLMO between the aMCI and NC groups. In GLMs, significant main effects of RA in RAR and IV in LER on 27-OH levels were shown (β = -461.43, p=.036; β = -149.35, p=.001, respectively). There was no difference in the effects of circadian parameters on 27-OH levels between the aMCI and NC groups (p>.05).
Conclusion: In our study, a strong 24-hour activity rhythm was associated with lower 27-OH levels, indicating less cholesterol metabolic dysfunction. It suggests that changes in circadian rhythm may affect cholesterol metabolism in preclinical AD patients.
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1010

BRUXISM AND NON-FUNCTIONAL JAW MUSCULAR ACTIVITY IN THE DISORDERS OF CONSCIUSNESS

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Introduction: In the last decades, the role of the neurophysiological techniques in the assessment of Disorders of Consciousness (DOCs) after severe acquired brain injuries has been enhanced, leading to a growing interest in this challenging field. However, only few works focused on the presence of bruxism or non-functional jaw muscular activity (NFJMA) in these patients. Here we present our experience in 32 patients assessed with a long lasting polygraphy (PG).
Methods: Thirty-two patients (14 females and 18 males, mean age 55.3 + 11.7 years) with prolonged or chronic DOC were consecutively enrolled as part of a national, multicentric clinical trial aimed at evaluating the tolerance and the efficacy of treatments for sleep disorders in DOC patients. All the patients underwent to a 24h PG visually inspected in order to determine the periods of wakefulness or sleep on the basis of PG pattern(s), as well as the occurrence of bruxism or NFJMA.
Results: Bruxism or NFJMA were found in 9 out of 31 patients, during periods of sleep (3 patients), awake (3 patients) or both (3 patients). We detected two forms of NFJMA in our case-series:

a) a sustained (tonic) contraction of masseter and mylohyoid progressively weaker until returning to previous muscle tone in 2-10 seconds; b) phasic contractions of masseter and mylohyoid, detectable as a biphasic, waxes and wanes activity, typically lasting 0.25-0.5 seconds and usually repeated with pseudo-rhythmic intervals of 0.5-1.5 seconds and often limited to 4-15 events. In 3 patients muscular activity was continuous or subcontinuous for a very long time (up to 1.5 hours), always maintaining 0.75-1.5 Hz frequency.
Conclusion: Although much is unknown about the non-functional jaw muscular activity, our work demonstrated that the bruxism and NFJMA are very frequent in DOC patients.
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1011
CHILDHOOD PREDICTORS AND ADULT FACTORS ASSOCIATED WITH LONG-TERM SLEEP DISTURBANCE IN TOURETTE'S DISORDER

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Introduction: Tourette's Disorder (TD) is a childhood-onset neurological disorder characterized by motor and vocal tics present beyond one year. Sleep disturbance presents in 80% of individuals with TD and rises with advancing age. Common clinical correlates are tic severity, functional impairment, female sex, and co-occurring psychiatric symptoms, including attention-deficit/hyperactivity disorder (ADHD), obsessive-compulsive disorder (OCD), anxiety and depression. However, we lack understanding of long-term predictors of sleep disturbance in TD. Therefore, this investigation examined childhood predictors and adolescent/adult factors associated with sleep disturbance in a treatment follow-up sample of adolescents/adults with TD.
Methods: Eighty participants of a randomized-placebo controlled trial of behavior therapy for tics in childhood (M = 11.47, SD = 2.42 years) received follow-up evaluation 11.7 (SD = 1.25) years later in adolescence/adulthood (M = 22.87, SD = 2.70 years). At baseline and long-term follow-up, an independent evaluator assessed tic severity tic-related impairment and psychiatric diagnosis via interviews. At baseline, children rated anxiety and depression, and parents rated ADHD, and provided demographic and psychiatric history (e.g., tic and stimulant medication status). At follow-up, adolescents/adults rated anxiety, depression, and ADHD severity, and reported tic medication and stimulant medication status since trial termination. Multiple linear regression analysis was performed without and with backward elimination to examine childhood predictors and adult factors (sex, tic and stimulant medication status, tic severity and impairment, anxiety, depression, and ADHD severity, OCD diagnosis) sleep disturbance (Pittsburgh Sleep Quality Index) at long-term follow-up.
Results: Childhood tic-related impairment significantly predicted sleep disturbance ($\beta = 0.35$, $t = 2.66$, $p = .010$). However, with backward elimination both childhood tic-related impairment ($\beta = 0.32$, $t = 2.81$, $p = .007$) and depression ($\beta = 0.33$, $t = 2.92$, $p = .005$) significantly predicted sleep disturbance. There were no significant adolescent/adult factors associated with sleep disturbance. However, backward elimination showed depression was associated with sleep disturbance ($\beta = 0.46$, $t = 3.95$, $p < .001$).
Conclusion: Findings highlight the role of tic-related impairment in childhood and depression in childhood and adulthood in sleep disturbance in adolescents/adults with TD. Findings suggest the utility of targeted intervention for tic-related impairment and depression to minimize their long-term influence on sleep in TD.
Support (if any):

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1012
CONCORDANCE AND TEST-RETEST CONSISTENCY OF SLEEP BIOMARKER BASED PHENOTYPING OF NEURODEGENERATIVE DISORDERS

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Introduction: In this pilot study, the diagnostic agreement for sleep biomarker-based neurodegenerative disorder (NDD) risk probabilities was evaluated in patients with Alzheimer's disease dementia (AD), Lewy Body disease (LBD), and isolated REM sleep behavior disorder (iRBD) and controls with a Mini-Mental State Exam scores>28.
Methods: Sleep biomarkers recorded with the Sleep Profiler (Advanced Brain Monitoring, Inc) were used as inputs to a 4-class machine learning algorithm trained to assign NDD risk probabilities to AD=27, LBD=19, iRBD=15 and controls (CG=58). Input variables included age, time-REM, non-REM hypertonia, autonomic-activation index, spindle-duration, atypical-N3, time-supine, sleep-efficiency, relative-theta, and theta/alpha. Records with CG output probabilities >70% were labeled Probably-normal, and from 45-70% Likely-normal with indications of a NDD added when the LBD, AD or prodromal synucleinopathy (pSYN) risks exceeded approximately 25%. Similar thresholds were used to assign Likely- or Probable-LBD, AD, or pSYN based each of the group probabilities. Classification accuracies were evaluated in AD=37, LBD=19, iRBD=19 and CG=61 records. Longitudinal test-retest reliabilities were assessed for CG (n=45, range 8-56 months), and after six-months for LBD (n=10) and AD (n=9).
Results: In the AD group, NDD risk assignments were consistent with diagnoses=85%, with Probable-NDD=59%,

Likely-NDD=11%, Normal plus AD/Mixed indications=15%, but with 5%=Probably-normal. In the LBD group, assigned risks were consistent with the diagnosis=79%, with Probable-NDD=74%, Normal with pSYN indications=5%, but with 11%=Probably-normal. In the iRBD group, Probable-NDD=42%, Normal plus pSYN indications=26% and Probably-normal=32%. In the CG group, 89% were assigned minimal NDD risks with Probably-normal=67%, Normal plus indications=22%, but with Likely NDD=8% and Probable NDD=3%. The AD test-retest reliability showed the same NDD classifications=78%, with slightly increasing=11% and decreased=11%. In the LBD group, the same NDD classifications were achieved=80%, with trending equivalence=10%, and decreasing severity=20%. The CG test-retest reliability showed the same NDD classifications=76%, with trending equivalence=22%, and increased severity=2%.

Conclusion: Consistencies between the diagnoses and assigned NDD risks and test-retest classification agreements were approximately 80% in the AD, LBD, and CG groups. In the iRBD group, the NDD risks were disbursed consistent with the range of expected severities. These results needed to be cross-validated in independent NDD datasets.

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1013

CROSS VALIDATION OF SLEEP BIOMARKER BASED PHENOTYPING OF NEURODEGENERATIVE DISORDERS

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Introduction: n this cross-validation study, the distributions of sleep biomarker-based neurodegenerative disorder (NDD) risk were evaluated across a spectrum of NDD patients and presumed controls which were independent of the model development dataset.

Methods: Variables that included age, time-REM, non-REM hypertonia, autonomic-activation index, spindle-duration, atypical-N3, time-supine, sleep-efficiency, relative-theta, and theta/alpha obtained with Sleep Profiler were used to train a 4-class machine learning algorithm that generated probabilities of NDD risk for the groups: Alzheimer's dementia (AD), Lewy body disorder (LBD), prodromal synucleinopathy (pSYN based on REM sleep behavior disorder patients), and controls (CG). Records with CG output probabilities >70% were labeled Probably-normal, and from 45-70% Likely-normal with indications of a NDD added when the LBD, AD or pSYN risks exceeded approximately 25%. Similar thresholds were used to assign Likely- or Probable- LBD, AD, pSYN or Mixed based on the group probabilities. This cross-validation study was designed to use datasets that were independent of those used to train the classification algorithm. Thus, NDD risk distributions were evaluated in patients with mild cognitive impairment (MCI=71), Parkinson's disease (PD=16), progressive supranuclear palsy (PSP=21) and control subjects (NC=41) with Mini-Mental State Exam scores>28 and/or normal for MCI by Petersen criteria.

Results: In the MCI group, NDD risk assignments were Probable-AD=26%, -Mixed=10%, -LBD=1%, Likely-AD=7%, -Mixed=6%, -LBD=3%, -pSYN=1%, Likely-Normal indications-AD=9%, -pSYN=7%, -Mixed=4%, and Probably-Normal=26% In the PSP group, Probable-LBD=43%, -Mixed=29% and -pSYN=4%, Likely-Mixed=10%, Likely-Normal indications AD=10%, and Probably-Normal=4%. In the PD group, Probable-LBD=13%, -pSYN=13%, -AD=6%, Likely-Mixed=19%, -pSYN=6%, Likely-Normal Indications-pSYN=19%, -AD=12%, Likely-Normal=6% and Probably-Normal=6% In the NC group, 83% were assigned minimal NDD risk with Probably-Normal=70%, Likely-Normal plus indications=13%, but with Likely NDD=13% and Probable NDD=4%.

Conclusion: NDD risks were disbursed in a manner consistent with the range of severities expected In MCI and PD groups, with 25% exhibiting relatively normal sleep patterns. Over 70% of the PSP patients exhibited probable NDD risk, with patterns similar to those with LBD. The NC NDD risk distributions were consistent with those assigned to the CG used for model development.

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1014

EFFECTS OF SLEEP ON REAL-WORLD DAILY DECISIONS TO DRIVE IN OLDER ADULTS WITH NEURODEGENERATION

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Introduction: Sleep dysfunction increases the risk of mild cognitive impairment (MCI) and Alzheimer's Disease (AD). Emerging sensor technologies can index real world (RW) sleep and instrumental activities of daily living affected by neurodegeneration, as outlined below.

Methods: 85 legally licensed active drivers with cognitive decline (76 MCI, 9 mild AD) (mean age = 75.6 years; 37 females) and 54 age and education-matched controls (mean age= 74.7 years; 36 females) participated. Cognitive status was assessed using standardized neuropsychological tests according to NIA-AA guidelines. Sensor systems installed in participants' own vehicles recorded driving incidence (driving or not each day). Sleep was recorded using wrist-worn actigraphy, and verified with self-reported sleep diaries over three continuous months. A mixed-effect logistic regression analyzed daily driving incidence with predictors including z-scores of total sleep time (TST) and sleep efficiency (SE) in previous night, and cognitive status (MCI or AD v. controls), adjusted for age, gender, employment status, and driving season.

Results: From 9,214 days of data on nightly sleep and next day driving, increase in TST significantly reduced driving incidence (21% per standard deviation [SD]; Odds Ratio [OR] = 0.79, 95% Confidence Interval [CI] = 0.74 – 0.84, $p < 0.001$). Increase in SE was associated with increased driving incidence among those with cognitive decline, compared to controls (15% per SD; OR = 1.14, 95% CI = 1.03 – 1.27, $p = 0.01$).

Conclusion: Findings underscore the value of RW digital biomarkers to track the effects of neurodegeneration on sleep and instrumental activities of daily living. Deciding to drive increased with greater sleep efficiency, particularly for those with cognitive decline. Quantitative profiles of sleep and driving behavior offer novel opportunities for early detection of the effects of AD.
Support (if any): The present study is supported by the National Institute on Aging at the National Institutes of Health (5R01AG17177-18).

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1015

EVALUATION OF ACTIGRAPHY SENSORS: DETECTING DAYTIME SLEEP AFTER STROKE IN AN INPATIENT REHABILITATION HOSPITAL

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Introduction: Excessive Daytime Sleepiness (EDS) is common poststroke, significantly impacting rehabilitation participation and quality of life. Early detection of EDS through prolonged daily sleep and wake monitoring is crucial for prompt intervention and improved care. Actigraphy is a promising sleep monitoring technique that circumvents the high cost and low portability of extended polysomnography and the limited reliability of self-reporting. While actigraphy is often used in healthy adults, its application to daytime sleep measurement in the poststroke population remains unexplored. This study assesses the efficacy of actigraphy and its commonly used scoring algorithms to detect daytime sleep in the poststroke population.
Methods: ActiGraph wGT3X-BT and ActiWatch Spectrum were placed on the less affected wrist of participants. Trained observers monitored daytime sleep occurrences by checking on participants every 10 minutes during non-therapy periods, recording behaviors as active, sedentary, or asleep. The average observation period for each participant was approximately eight hours. Actigraphy data were cross-referenced with on-site, time-specific observations. Both the ActiWatch (Autoscore AMRI) and ActiGraph (Cole Kripke, Sadeh) use non-data-driven algorithms to estimate wake (0) or sleep (1) given a user-determined parameter. We computed an F2 score to summarize the algorithm's performance at differentiating wake and sleep, placing more weight on the algorithm's sensitivity to capture daytime sleep.
Results: Twenty-seven individuals (19F/8M; average age 62.33 ± 3.04 years) were recruited from the poststroke inpatient unit of a rehabilitation hospital. The ActiGraph Cole-Kripke algorithm (configured with minimum sleep time=15 mins, bedtime=10 mins, and wake time=10 mins) yielded the highest F2 score (F2=0.59), outperforming Sadeh (F2=0.57) and ActiWatch ARMI (F2=0.52) algorithms under their respective optimized parameters. When exclusively considering data from participants lying in bed, the ActiGraph device consistently achieved superior performance (F2=0.69) with the same optimized Cole-Kripke settings.
Conclusion: In poststroke patients in an inpatient rehabilitation unit, ActiGraph (Cole-Kripke) was better than ActiWatch in detecting daytime sleep. The results could help inform specific algorithms and parameters that can be readily implemented for daytime sleep monitoring and EDS detection in poststroke patients. Future considerations for enhanced algorithms should include posture detection to maximize efficacy.
Support (if any): NIH R01HD097786-01A1.

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1016

FRACTIONAL ANISOTROPY PREDICTS SELF-REPORT SLEEP SCORES DURING RECOVERY FROM MILD TRAUMATIC BRAIN INJURY

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Introduction: Diffusion Tensor Imaging is a structural neuroimaging technique used to assess white matter tract integrity, and a primary metric of this technique is fractional anisotropy (FA). Our assumption is that individuals who have sustained a mild traumatic brain injury (mTBI) may have structural damage that could be reflected in FA values. As increased sleep problems are commonly reported after an mTBI, we hypothesized that individuals with lower FA values would report more sleep difficulty.
Methods: This cross-sectional study included 145 adults and compared healthy controls (HC; N=32) to individuals recovering from mTBI (N=113) at different stages post-injury: 2 weeks and 1, 3, 6, and 12 months. Participants completed the Pittsburgh Sleep Quality Index (PSQI); higher scores on this measure indicate worse sleep quality. Participants underwent a diffusion weighted MRI scan. We used the QSIPrep preprocessing and reconstruction pipeline to extract fractional anisotropy (FA) values for 22 white matter tracts (WMTs). We ran a stepwise linear regression to determine if the average FA values of different WMTs could contribute to a model that predicts individuals PSQI global score.
Results: The stepwise linear regression revealed two significant predictors of participants' PSQI global scores. Together, the left inferior longitudinal fasciculus (ILF) and right vertical occipital fasciculus (VOF) accounted for significant variance in self-report sleep scores (R^2=.094, F(2,139)=7.185, p=.001). The left ILF had an inverse relationship with PSQI global score (β=-.344, p<.001), such that greater FA in this tract was associated with lower sleep difficulty scores. The right VOF had a positive relationship with PSQI (β=.202, p=.029), such that greater FA in the right VOF was associated with greater sleep difficulties. Post-hoc correlations showed that this positive relationship was driven by the daytime dysfunction subscale of the PSQI (p=.004).
Conclusion: Contrary to our hypothesis, we found a mixed pattern of associations between FA values and self-reported sleep. However, this may be due to the right VOF being more associated with waking dysfunction, as opposed to sleep-related dysfunction. Delving more deeply into wake versus sleep promoting WMTs may further illuminate why structural integrity has mixed effects on functioning (i.e., sleep) and performance.
Support (if any): USAMRAA Grant: W81XWH1210386

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1017

HEALTHY SLEEP, HEALTHY MIND: EXAMINING THE RELATIONSHIP BETWEEN OBJECTIVE SLEEP MEASURES AND DELIRIUM DEVELOPMENT

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Introduction: Delirium is a sudden, transient, but reversible neurological condition as a result of acute stressors, such as hospitalization for surgery or acute illness, and predisposed by many underlying conditions, including age, cognitive decline, and multiple comorbidities. We recently showed that self-reported sleep disturbances prior to surgery or illness are associated with an increased risk of delirium. The current study aimed to test whether objective sleep measures derived from actigraphy predict incident delirium.

Methods: Using the UK Biobank, we analyzed actigraphy data of ~7 days collected from 57,556 middle-older aged UK Biobank participants who had at least one hospitalization event during follow-up of up to 8 years. Four measures were extracted from the actigraphy data to objectively define daily sleep behavior: overnight sleep duration (between 9pm-7am), wake after sleep onset (WASO), daytime sleep duration (between 9am-7pm), and daytime sleep frequency. Cox proportional hazards models analyzed whether these sleep behaviors predicted an increased risk of incident delirium defined using the IDC-10 coding (specifically, code F05).

Results: In total, 606 individuals developed delirium (10.5/1,000) after the actigraphy assessment. A U-shaped relationship between overnight sleep duration and delirium risk was observed: short (< 7h) overnight sleepers (OR 1.23, 95% CI: 1.02-1.49, p=0.029) and long (>8h) overnight sleepers (OR 1.44, 95% CI: 1.01-2.04, p=0.043) had greater relative risk compared to 7-8h sleepers. Participants with longer daytime sleep duration (OR 1.46, 95% CI: 1.35-1.59, p< 0.001) and more frequent daytime sleep (OR 1.15, 95% CI: 1.11-1.18, p< 0.001) also showed an increased risk of delirium development. WASO was not significantly associated with the risk of delirium development.

Conclusion: Nocturnal sleep duration, daytime sleep duration, and daytime sleep frequency were associated with an increased risk for delirium. Further studies are required to confirm the present results, understand the underlying pathophysiology behind the relationship, and test whether optimizing sleep health can reduce the risk of developing delirium.

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1018

MINIMAL EFFECT OF LONG-TERM CLONAZEPAM ON COGNITIVE FUNCTION IN PATIENTS WITH ISOLATED RBD

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Introduction: Despite its widespread use in patients with isolated rapid eye movement sleep behavior disorder (iRBD), the cognitive effect of clonazepam is uncertain. This study aimed to investigate effect of cumulative clonazepam on cognitive function in iRBD patients.

Methods: Demographic characteristics, baseline cognitive test, and most recent cognitive test information were collected retrospectively. Based on cumulative clonazepam doses, patients were classified into four subgroups: group 1 < 365 mg (1 mg * 1 yr); 365 mg ≤ group 2 < 1,095 mg (1 mg * 3 yr); 1,095 mg ≤ group 3 < 2,190 mg (1 mg * 6 yr); and group 4 ≥ 2,190 mg. Cognitive test scores were calculated as z-scores adjusted for age, education, and gender.

Results: This study included 101 iRBD patients (63 males). Groups 1, 2, 3, and 4 had 14, 20, 32, and 35 patients, respectively. In within-group comparisons, follow-up Digit Span Backward test and the Trail Making Test A (TMT-A) scores decreased in group 3, and follow-up TMT-A and the Trail Making Test B scores decreased significantly in group 4. In the multiple regression analysis to determine influential factors on cognitive decline, cumulative clonazepam dose did not show a significant correlation with any cognitive domain. Follow-up cognitive function showed significant correlation only with baseline cognitive function.

Conclusion: Memory and executive functions tended to decline in iRBD patients. However, there was no significant effect of cumulative clonazepam. There was no evidence that long-term use of clonazepam was related to cognitive decline in iRBD patients.

Support (if any):

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1019

OBSTRUCTIVE SLEEP APNEA AND COGNITIVE FUNCTIONING 2 YEARS AFTER INJURY IN ADULTS WITH TRAUMATIC BRAIN INJURY

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Introduction: Obstructive sleep apnea (OSA) is associated with structural and functional brain changes and reduced cognition. Persons with traumatic brain injury (TBI) show disproportionately higher risk of OSA compared to community samples. Moderate-to-severe TBI often results in disabling cognitive sequelae, although the impact of OSA on cognitive outcome after TBI is poorly understood. The purpose of this study was to examine the degree to which OSA features predict cognitive performance during early TBI recovery. We hypothesized that greater obstructions, oxygen saturation, and cortical arousals would predict poorer cognition.

Methods: This was a secondary analysis of participants co-enrolled in the TBI Model Systems (TBIMS) and Comparison of Sleep Apnea Screening and Diagnostic Tools (CSAS) studies. Participants underwent attended PSG while admitted for neurorehabilitation following moderate-to-severe TBI. Telephone follow-up interviews were conducted 2 years ± 3 months from injury date and included the Brief Test of Adult Cognition by Telephone (BTACT). Spearman correlations were calculated between PSG metrics and BTACT performance.

Results: Of 184 participants co-enrolled in the CSAS and TBIMS studies, 123 had valid BTACT data and compromised the analytical sample. There was a negative correlation between the

total Apnea-Hypopnea Index (AHI) and the BTACT Executive Function composite (ρ=-0.189, p=0.040), working memory (ρ=-0.199, p=0.029), and reasoning (ρ=-0.192, p=0.035). Cortical arousals was negatively correlated with reasoning (ρ=0.211, p=0.021). Correlations between PSG metrics of oxygen desaturation (nadir, desaturation index, percent sleep time below 90% peripheral oxygen saturation) and BTACT performance were statistically nonsignificant.
Conclusion: This study provides evidence that PSG metrics of OSA are associated with decreased cognitive performance during early recovery from moderate-to-severe TBI. Future studies should examine the degree to which OSA treatment can ameliorate cognitive deficits following TBI.
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1020

□REST-ACTIVITY RHYTHM LINKED TO PARKINSONISM IN OLDER ADULTS: RESULTS FROM THE RUSH MEMORY AND AGING PROJECT

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Introduction: While the inter-relationship between parkinsonism and Parkinson's disease (PD) in older adults remains unclear, both phenotypes are related to PD pathology. Adults with PD commonly exhibit nonmotor symptoms such as disturbances in sleep-wake cycles or rest-activity rhythm (RAR). In a previous study of older men, RAR disturbances preceded the development of PD. This current study examines whether RAR disturbances are associated with incident parkinsonism in a cohort of older community-dwelling men and women.
Methods: We examined 999 older adults (age=80.1; 76% female) in the Rush Memory and Aging Project who were free from parkinsonian symptoms (i.e., bradykinesia, rigidity, tremor, postural instability) during their baseline actigraphy assessment. Participants completed annual motor tests to identify parkinsonian symptoms during follow-up. Incident parkinsonism was rendered when ≥2 parkinsonian symptoms were present. Parametric and nonparametric RAR measures were derived from actigraphy including amplitude (representing the strength of the ~24-h RAR rhythms); acrophase (representing the peak activity time); the most active 10-hour (M10) and least active 5-hour (L5) period over 24-hours; intradaily stability (IS; estimated regularity of a 24-hour pattern); and interdaily variability (IV; fragmentation across 24-hour patterns). Cox proportional hazards models were performed to examine the associations between RAR measures and incident Parkinsonism. Models were adjusted for age, sex, and education.
Results: Parkinsonism was observed in 448 participants after an average of 6.62 years. Risk for parkinsonism was significantly higher in participants with lower amplitude (Hazard Ratio [HR] per 1-SD decrease: 1.36, 95% CI: 1.21-1.53), lower M10 (HR per 1-SD decrease: 1.33, 95% CI: 1.19-1.48), and higher IV (HR per 1-SD increase: 1.23, 95% CI: 1.13-1.34). The observed associations were similar in men and women. There was no significant association between the risk of parkinsonism and acrophase, L5, or IS.
Conclusion: Perturbed RAR were associated with an increased risk of incident parkinsonism in older men and women, suggesting parkinsonism could be a prodromal manifestation of PD in both genders. Further analysis should explore the underlying mechanisms of this relationship.
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1021

SAMELISANT: CLINICIAN AND PATIENT GLOBAL IMPRESSION FROM A DOUBLE-BLIND, PHASE-2 STUDY IN PATIENTS WITH NARCOLEPSY

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Introduction: Samelisant (SUVN-G3031) is a potent and selective histamine 3 receptor (H3R) inverse agonist. Samelisant exhibited desired pharmacokinetic properties in rodents and healthy human volunteers. Preclinical studies in orexin knockout mice demonstrated wake promoting and anticataplectic effects of samelisant. To confirm the preclinical findings, Samelisant was evaluated as monotherapy for the treatment of excessive daytime sleepiness (EDS) in patients with narcolepsy with or without cataplexy. The primary endpoint was changes in the Epworth Sleepiness Scale (ESS) scores. Clinician and Patient Global Impression for EDS were assessed as secondary and exploratory endpoints.
Methods: Two doses of samelisant (2 and 4 mg) were evaluated as a monotherapy in a Phase-2 study for the treatment of EDS in subjects with narcolepsy (ClinicalTrials.gov Identifier: NCT04072380). Subjects diagnosed with narcolepsy as per ICSD-3 criteria, aged between 18 to 65 years with an ESS score of ≥12 and mean Maintenance of Wakefulness Test (MWT) time of < 12 min were recruited in the study. A total of 190 subjects were randomized into 3 treatment arms (placebo, samelisant 2 mg and samelisant 4 mg) in 1:1:1 ratio and received either placebo or samelisant once daily for 2 weeks. The primary efficacy endpoint was the change in ESS score from baseline to week 2. Clinical Global Impression – Severity (CGI-S) was a secondary endpoint, whereas change in Patient Global Impression – Change (PGI-C) and Clinical Global Impression of Change (CGI-C) scores related to EDS were exploratory endpoints.
Results: At the end of the double-blind period, the samelisant treated groups demonstrated clinically and statistically significant improvements in CGI-S (p< 0.01), PGI-C (p< 0.001) and CGI-C (p< 0.0001) with regards to EDS. The proportion of patients reporting improvement in EDS was significantly higher in the samelisant treatment arms compared to placebo arm.
Conclusion: Treatment with samelisant as monotherapy resulted in significant improvement in excessive day time sleepiness as assessed by both clinicians and patients. These outcomes support the efficacy of samelisant observed in the primary endpoint, ESS, in patients with narcolepsy with or without cataplexy.
Support (if any):

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1022

SLEEP IN DUCHENNE MUSCULAR DYSTROPHY

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Introduction: Duchenne Muscular Dystrophy (DMD), the prevalent childhood-onset muscular dystrophy, affects 1 in 3500 males due to a mutation in the DMD gene, leading to compromised dystrophin production and resultant muscle weakness. Steroid therapies, including prednisolone and deflazacort, commonly used in DMD treatment, may contribute to weight gain. Patients with DMD frequently experience sleep symptoms or disorders, particularly sleep-disordered breathing, impacting their quality of life.
Methods: The objective of this chart review of DMD patients in a multi-disciplinary DMD clinic at a tertiary referral center over a 3-month period is to estimate from the most recent notes, particularly the neurology and pulmonary notes, the prevalence of sleep symptoms and disorders in our multidisciplinary clinic. Clinical observations were also made and recorded by the investigators in the neuromuscular division of the DMD multidisciplinary clinic.
Results: Of the 29 patients reviewed, the average age was 13.3 (SD 3.8) years. All of the patients were male. The racial groups the patients identified as were: 11 (37.9%) "White," 3 (10.3%) "Black or African American," 2 (6.9%) "Asian," 8 (27.6%) "Other," and 5 (17.2%) "Declined to Answer." The average BMI was 24.7 (SD 5.3). Of the 29 patients reviewed, 18 (62.1%) exhibited sleep symptoms or disorders. Of these 18 patients, 6 (33.3%) were treated with CPAP or BiPAP.
Conclusion: Our findings align with existing literature, emphasizing the prevalence of sleep-related symptoms and disorders in DMD patients. As DMD management progresses and treatment options expand, resulting in increased life expectancy, addressing sleep-related challenges becomes imperative to enhance the overall quality of life for these individuals. Further research is essential to delve into the intricate relationship between DMD and potential sleep co-morbidities, guiding interventions that can positively influence clinical trajectories and improve overall quality of life.
Support (if any):

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1023

SOLRIAMFETOL AND MAINTENANCE OF WAKEFULNESS OUTCOMES IN PATIENTS WITH NARCOLEPSY AND OBSTRUCTIVE SLEEP APNEA

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Introduction: Patients with excessive daytime sleepiness (EDS) associated with narcolepsy or obstructive sleep apnea (OSA) struggle to maintain wakefulness. Solriamfetol (Sunosi®) is a dopamine/norepinephrine reuptake inhibitor with agonistic properties at TAAR1 and serotonin 1A receptors; it is approved to treat EDS associated with narcolepsy (75–150 mg/day) or OSA (37.5–150 mg/day). This post-hoc analysis characterized the effects of solriamfetol on the propensity of participants with EDS associated with narcolepsy or OSA to maintain wakefulness.
Methods: The safety and efficacy of solriamfetol has been evaluated in participants with EDS and narcolepsy or OSA in the phase 3 trials, TONES 2 and TONES 3. Participants were randomized to placebo or solriamfetol (37.5 mg [OSA only], 75 mg, 150 mg, or 300 mg) once daily for 12 weeks. This post-hoc analysis evaluated the proportion of participants who achieved improvement from baseline on various 40-minute Maintenance of Wakefulness Test (MWT) thresholds (≥5, ≥10, ≥15, and ≥20 minutes) and mean sleep latencies ≥30 and ≥40 minutes at weeks 1, 4, and 12. Comparisons between solriamfetol and placebo were evaluated using Fisher's exact test.
Results: A greater proportion of participants with narcolepsy achieved improvement from baseline of ≥15 and ≥20 minutes on the MWT with solriamfetol 150 mg (36% and 18%, respectively) and 300 mg (38% and 28%) compared with placebo (4% and 4%) at week 12 (P≤0.028); findings were similar at week 12 in participants with OSA with solriamfetol 75 mg (28% and 13%), 150 mg (37% and 25%), and 300 mg (44% and 28%) compared with placebo (8% and 3%; P≤0.034). A greater proportion of participants with narcolepsy achieved MWT sleep latency ≥30 minutes at week 12 with solriamfetol 150 mg (24%) and 300 mg (30%) compared with placebo (2%; P≤0.002); results were similar in participants with OSA for MWT sleep latency ≥30 minutes at week 12 with solriamfetol 75 mg (28%), 150 mg (34%), and 300 mg (44%) compared with placebo (11%; P≤0.012).
Conclusion: These findings suggest solriamfetol leads to substantial improvements on objective propensity to stay awake in a large proportion of patients with narcolepsy or OSA when compared with placebo.
Support (if any): Axsome Therapeutics, Jazz Pharmaceuticals

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1024

SURWEY: TREATMENT OF EXCESSIVE DAYTIME SLEEPINESS WITH SOLRIAMFETOL: INITIATION, TITRATION, AND OUTCOMES

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Introduction: Solriamfetol (Sunosi®), a dopamine/norepinephrine reuptake inhibitor with agonistic properties at TAAR1 and 5HT1A receptors, is a wake-promoting agent approved to treat excessive daytime sleepiness (EDS) associated with narcolepsy (75–150 mg/day) or obstructive sleep apnea (OSA; 37.5–150 mg/day). Real world data on solriamfetol safety and efficacy remains limited. Here we review real-world survey results to evaluate dosing/titration strategies and outcomes on EDS in patients with OSA, narcolepsy, and the pooled (OSA + narcolepsy) population.
Methods: Data from a retrospective chart review (SURWEY) by German physicians who prescribed solriamfetol for EDS associated with narcolepsy or OSA were analyzed. Inclusion criteria have been previously reported. Initiation and titration strategies (new-to-therapy, changeover, add-on) and Epworth Sleepiness Scale (ESS) scores are reported for each diagnosis and the pooled population to examine EDS as a symptom independent of etiology.

Results: Differences in baseline age, sex, and body mass index were observed for OSA (n=83) and narcolepsy (n=71) patients. Most common initiation strategy was new-to-therapy (n=63/83; 74.7%) for OSA and changeover (n=44/71; 62.0%) for narcolepsy. Patients with a final dose ≥150 mg/day were n=16 (19.5%), n=31 (45.6%), and n=47 (26.1%) for OSA, narcolepsy, and pooled, respectively. At initiation, mean±SD ESS scores were similar: 16.0±3.2 (OSA), 17.6±3.1 (narcolepsy), 16.7±3.2 (pooled). Mean±SD change from baseline in ESS scores at final follow-up were –5.4±3.6 (OSA), –4.5±3.2 (narcolepsy), –5.0±3.5 (pooled). In the pooled analysis, ESS scores improved by 5.5, 4.7, and 4.4 in new-to-therapy, changeover, and add-on groups, respectively. In the changeover group, ESS scores improved by 5.7, 4.7, 4.6, and 4.0 points in patients who switched to solriamfetol from modafinil (n=13), stimulants (n=3), pitolisant (n=16), or unknown medication (n=21), respectively, while patients who added solriamfetol to pitolisant (n=13) or modafinil (n=3) improved by 4.4 and 3.3 points, respectively. Common adverse effects were headache, insomnia, and decreased appetite.
Conclusion: These real-world data describe the use of solriamfetol in patients with EDS in OSA or narcolepsy. Titration strategies differed by primary etiology but changes in ESS scores were similar. Although sample size was limited, clinically meaningful improvements in ESS scores were observed with solriamfetol regardless of switch/add-on medication.
Support (if any): Axsome Therapeutics, Jazz Pharmaceuticals, Pharmanovia

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1025

THE IMPACT OF DEPRESSION ON NEUROCOGNITIVE FUNCTIONS AND CONVERSION IN ISOLATED REM SLEEP BEHAVIOR DISORDER

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Introduction: Depression is frequently observed in patients with isolated REM sleep behavior disorder (iRBD). The aim of this study was to analyze cognitive function and quantified electroencephalography (QEEG) in iRBD patients according to the presence of depression, and to evaluate the impact of depression on the conversion to neurodegenerative diseases.
Methods: A total of 90 individuals with iRBD were included in this study. They were followed for up to 9 years, and 21 of them were converted to Parkinson's disease or dementia. Phenoconversion was defined when a definitive diagnosis of parkinsonism by neurologists or any form of dementia by geriatric psychiatrists was established based on evident clinical symptoms. The diagnosis of depression (27 among 90 iRBD) was made based on the initial interview or taking antidepressant medication.
Results: The depressed group showed poor performance in the executive function (p= 0.029, Stroop color test) than the non-depressed group. The depressed group tended to have lower z-scores than the non-depressed group in global cognition, attention, memory, and frontal/executive domains. The QEEG results, the relative gamma power in the temporal and parietal region, relative high gamma power in the parietal region were significantly increased (p=0.049; p=0.032; p=0.008) in the depressed than the non-depressed group. The conversion was significantly increased in iRBD patients with depression than iRBD without depression (p=0.013). The depression in iRBD patients had 3.319 of hazard ratio (p=0.011) for the risk of conversion to neurodegenerative diseases.
Conclusion: Depressive symptoms in iRBD patients should be monitored as aggravating cognitive dysfunction and a risk factor for conversion.
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1026

VALIDATION OF THE SITUATIONAL SLEEPINESS SCALE

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Introduction: The Epworth Sleepiness Scale (ESS) is the gold standard measure subjective daytime sleepiness. Since the inception of the ESS 25 years ago, modern life has evolved considerably and the situations posed by the ESS have become dated. This interim analysis introduces the Situational Sleepiness Scale (SSS) which focuses on common activities occurring in the modern world.
Methods: A group of sleep physicians and staff between Stanford and the UK Biobank developed the questionnaire. An initial set of questions were distributed to subjects, and through multiple iterations of subject feedback and subsequent revision, were refined into its current form of eleven situations. To explore further the scale as a replacement for the ESS, the SSS and the eight situation ESS were given in tandem to patients and visitors of the Stanford Sleep Clinic.
Results: A correlation coefficient between the ESS and SSS was run on 121 completed questionnaires. Our result to date indicates a strong correlation between both scales (R2=0.74, p<.0001). The mean score for the SSS was 7.74 and 7.36 for the ESS. The standard deviation for the SSS was 5.11 compared to 4.74 for the ESS. A test of variance produced a value of 25.9 for the SSS and 22.3 for the ESS. Thirty-four subjects scored ≥ 10 in this sample using the ESS and 26 of these subjects had a value ≥ 10 for the SSS. Most of the subjects who scored ≥ 10 on the ESS scored ≥ 10 on the SSS and vice versa suggesting that a similar cutoff could be used for defining daytime sleepiness on the SSS.
Conclusion: In this interim analysis, we found the Situational Sleepiness Scale to be easily administered and to correlate well with the ESS. In future studies we will examine consistency of scores across item, stability over time/ repeatability, and explore psychometric properties. Additional studies aiming at gathering several hundred subjects with various diagnoses are ongoing. As the SSS goes up to 33, but has a similar cutoff of ten on the correlation, we believe the SSS could be more discriminative than the ESS for very sleepy patients such as narcoleptics.
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1027

VALPROIC ACID AND CENTRAL SLEEP APNEA: A RETROSPECTIVE STUDY

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Introduction: Central sleep apnea (CSA) is associated with several medical conditions (e.g., heart failure, atrial fibrillation) and medications (e.g., opioids, ticagrelor, sodium oxybate and valproic acid). We report a case of a 31-year-old female with bipolar disorder treated with valproic acid diagnosed with central sleep apnea on polysomnography, which revealed an apnea-hypopnea index of 150/hour, central apnea index of 112/hour, nadir oxygen saturation of 78%, and 38.6 minutes with oxygen saturation ≤ 88%. Echocardiogram, electrocardiogram, brain magnetic resonance imaging, serum acylcarnitine and serum ammonia levels were unremarkable. Total and free serum valproic acid level was 33 and < 3 mcg/mL, respectively. Two cases of central sleep apnea associated with valproic acid use, both of which improved upon discontinuation of valproic acid, have been reported in the literature. We started the patient on positive airway pressure and suggested she taper off valproic acid and then repeat polysomnography. Given the possible association between central sleep apnea and valproic acid use, we retrospectively analyzed patients receiving valproic acid at time of polysomnography.
Methods: We retrospectively identified patients between 2005-2017 who were prescribed valproic acid (n=6,169), and of these 72 received valproic acid within 90 days of polysomnography. After chart review, we were able to confirm that 29 received valproic acid at time of polysomnography via blood levels or clear chart documentation.
Results: Four patients (13.8 %) demonstrated a central apnea index ≥ 5 per hour (mean apnea-hypopnea index 39.2/hour +/- 32.2/ hour including a central apnea index 11.7 +/- 6.6/hour) during polysomnography. Although one patient (3.4 %), a 2-year-old child with Dravet syndrome and refractory/drug resistant generalized epilepsy, was diagnosed clinically with central sleep apnea, the other three patients were diagnosed with obstructive sleep apnea and had other potential reason(s) for the elevated central apnea index (e.g., opioid use as needed for migraines).
Conclusion: Our case describes a third report of central sleep apnea possibly associated with valproic acid, and our retrospective study indicates that this association is rare. Prospective sleep studies on patients before and after receiving valproic acid are warranted to determine if valproic acid causes central sleep apnea.
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1028

WAKE TIME AFTER MORNING AWAKENING AS A PREDICTIVE FACTOR FOR SEIZURES IN JUVENILE MYOCLONIC EPILEPSY

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Introduction: Seizure recurrence in the early morning is well known in Juvenile Myoclonic Epilepsy, the presence of seizures happens usually after waking up and there is a clear relationship with sleep as most of the seizures happen in a time frame that involves the next 30 to 120 minutes of wake time after sleep. We wanted to analyze the time frame that is most associated with seizure recurrence as that can have serious implications for safety, not to exclude driving in the morning hours.
Methods: We investigated on a sample of 20 patients with JME and the pattern on seizure recurrence in the morning. A time frame of wake after sleep was established as follows; the first 30 minutes, 30 to 60 minutes, 60 to 90 minutes and more than 90 minutes. Seizure diaries were given to patients and the seizure recurrence was evaluated. A variable that included earlier waking time in the morning was also taken into account. A follow up of 6 months was given in a retrospective manner. All patients were seen in an outpatient epilepsy clinic.
Results: All patients were into the JME spectrum, all patients were seen at least 3 times in the follow up time, 70 percent of all cases had at least one event of seizure recurrence, 10 percent had more than 3 events. The majority of the seizures were strongly associated with a wake after sleep time of 60 to 90 minutes. The patients that had an earlier wake time that was out of the usual sleep schedule had increased chances of seizure recurrence.
Conclusion: Patient with JME have a very close relationship of seizure recurrence with the sleep-wake cycle. The seizure recurrence is strongly associated with a time frame of 90 minutes after waking up. We conclude that the chance of seizure recurrence is less after the 90 minute mark, and that can reasonably be a potential target as far as allowing to drive a motor vehicle passed that time for safety issues. Earlier than usual morning awakenings can precipitate seizures in a greater degree.
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1029

ACTIGRAPHY-INFORMED POOR SLEEP HEALTH IS ASSOCIATED WITH WORSE COGNITIVE PERFORMANCE AMONG OLDER ADULTS

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Introduction: Sleep quality is a modifiable risk factor for Alzheimer's Disease and other dementias due to the role it plays in removal of beta-amyloid and tau from the brain during sleep. The aim of this retrospective observational study was to examine the association between cognition and domains of sleep health in older adults at baseline and over time.
Methods: Older adults (≥60 years) underwent comprehensive sleep and cognition assessments as part of annual evaluations for a longitudinal cohort study about dementia risk factors. Participants completed self-reported (Epworth Sleepiness Scale and Pittsburgh Sleep Quality Index) and objective (wrist-worn actigraphy) sleep assessments. Definitions for poor, moderate, and good sleep health were established based on composite scores derived from self-report only and from self-report plus actigraphy data using the RuSATED model. Verbal memory, attention, and executive function factors were measured annually. The relationship between composite sleep health scores and cognition factors at baseline and follow-up visits were assessed using linear mixed models adjusted for age, sex, and education.
Results: Among participants with available self-reported sleep health at baseline (N=174), 44.3% and 6.9% had moderate and poor sleep health, respectively. For those with actigraphy-informed sleep health at baseline (N=177), 56.5% and 11.9% had moderate and poor sleep health, respectively. Cross-sectional

analyses revealed that participants with actigraphy-informed poor sleep health had lower performance on verbal memory (β [SE] = -0.58 [0.29], p = 0.045) and on executive function (β [SE] = -0.48 [0.18], p = 0.009). No significant relationships between self-reported or actigraphy-informed sleep health and cognition factors were found in longitudinal analyses.
Conclusion: Participants with actigraphy-informed poor sleep health exhibited worse verbal memory and executive function at baseline. These findings underscore the potential influence of sleep health on specific cognitive functions, offering valuable insights for future research and clinical implications in the intersection of sleep health and prevention of Alzheimer's disease and other dementias.
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1030

APOE GENOTYPE AND SLEEP ARCHITECTURE

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Introduction: APOE4 genotype, a robust genetic risk factor for Alzheimer's Disease, is associated with reduced functional connectivity of the basal forebrain, one of the key regulators of sleep and wakefulness. The objective of this study was to examine the association between APOE4 genotype and sleep architecture.
Methods: This study included 1,793 participants aged 65-85 from the Sleep Heart Health Study (SHHS) who completed in-home, overnight polysomnography. Primary predictor was APOE4 allele carrier status: non-carriers (reference), heterozygotes and homozygotes. Outcomes included the following three characteristics of sleep architecture: time spent in slow wave sleep (SWS), time spent in rapid eye-movement sleep (REM) and the number of arousals per hour. We used linear regression to examine the association between APOE4 carrier status and each sleep architecture characteristic, adjusting for age, sex, marital status, and educational attainment.
Results: The sample included 9.5% people of color and 52.7% women. Median age was 73 (interquartile range = 69,77). Average duration of SWS and REM (minutes/night) by APOE4 genotype was: 62.7 and 68.7 (non-carriers); 63.0 and 67.6 (heterozygotes); and 63.0 and 70.7 (homozygotes). Average number of arousals among non-carriers, heterozygotes, and homozygotes was 18.5, 17.2, and 16.2 times/hour, respectively. Linear regression models showed that APOE4 carrier status was not associated with time spent in SWS or REM. The number of APOE4 alleles showed an inverse linear trend with arousals/hour, (β=-0.77 [95%CI=-1.96,0.42] in heterozygotes; β=-4.25 [95%CI=-8.01,-0.50] in homozygotes). Additional analyses using other sleep architecture measures, including the proportion of time spent in SWS or REM, SWS or REM duration/hour, wake after sleep onset (WASO), total sleep duration, and time spent in non-SWS sleep, all yielded non-significant results, except for total arousals/night, which exhibited an inverse linear trend with the number of APOE4 alleles (β=-3.64 [-10.44,3.16] in heterozygotes; β=-22.52 [-43.97,-1.07] in homozygotes).
Conclusion: Contrary to our expectations, APOE4 carriers did not show reduced sleep quality across various indices, including time spent in SWS, REM or WASO. They also showed reduced number of arousals. Our findings suggest that non-respiratory sleep problems may not be the primary pathway leading to an increased burden of Alzheimer's disease in APOE4 carriers.
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1031

ASSOCIATION BETWEEN OBJECTIVE SLEEP ARCHITECTURE AND BIOMARKERS OF ALZHEIMER'S DISEASE

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Introduction: Growing evidence suggests a bi-directional association between sleep and Alzheimer's disease (AD), with several studies showing an association between self-reported sleep disturbances and AD biomarkers. However, the association between polysomnography (PSG)-assessed sleep architecture and AD biomarkers remains unknown. We aim to investigate the associations between sleep architecture features and AD biomarkers in a clinical population with and without cognitive impairment.
Methods: We examined 128 participants [mean age of 70.9 years (±9.7), 43.8% of men] from an outpatient memory clinic, of whom 23 were healthy controls, 41 patients with mild cognitive impairment, and 64 patients with AD. Sleep architecture features were derived from PSG data and categorized by tertiles. Four AD biomarkers were measured, including tau-181, Brain-Derived Neurotrophic Factor (BDNF), and neurofilament light (NFL) obtained from blood samples, along with Aβ levels measured from amyloid positron emission tomography scans. Multivariable linear regressions models were performed to assess the associations between sleep architecture features and AD biomarkers.
Results: After adjustment for age, gender, APOE4 status, diabetes mellitus, smoking habits, and body mass index, participants in the highest REM latency tertile (i.e., with longer REM latency; >192.7 minutes) were associated with increased levels of tau-181 (β= 0.25, 95% confidence interval (CI)= 0.01;0.55) and Aβ (β= 0.15, 95% CI= 0.06;0.26), and with decreased level of BDNF (β= -0.51, 95% CI= -0.70;-0.20) compared to participants in the lowest tertile (i.e., with shorter REM latency; < 98.2 minutes). Moreover, being in the middle SWS percentage tertile (i.e., SWS percentage between 2.5 and 10.2) was associated with a lower level of tau-181 (β= -0.18, 95% CI= -0.34;-0.02) compared to being in the lowest tertile (i.e., shorter SWS percentage; < 2.5)). We did not find any association between AD biomarkers and sleep duration, efficiency, latency, or other sleep architecture features.
Conclusion: In this cross-sectional study of a clinical population, we highlight the importance of REM latency, and to a lesser extent, SWS percentage, in relation to AD biomarkers. Future research is needed to examine the longitudinal association between sleep architecture and AD biomarkers and clarify underlying mechanisms.
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1032

ASSOCIATION OF SLEEP DURATION AND APOE E4 STATUS ON BRAIN REGIONAL TAU DEPOSITION IN CLINICALLY NORMAL OLDER ADULTS

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Introduction: We examined interactive associations of sleep duration on regional tau-PET deposition in clinically-normal individuals, as a function of β-amyloid (Aβ), and apolipoprotein E (APOE) ε4 status.

Methods: This cross-sectional study analyzed preliminary data from 26 community-dwelling cognitively normal older-adults with baseline tau ([18F] PI2620) and Aβ ([11C] PiB) PET scans participating in NYU studies on sleep, aging and memory. Sleep duration was characterized as total sleep time (TST) using data from polysomnography (NPSG). Linear mixed effects models controlling for Aβ, age, sex, race, BMI and other sleep variables, examined a main association of TST with regional tau and a meta-region of interest, which was a composite of regions in the temporal lobe. Interactions between TST*Aβ, and TST*APOE ε4 on these regions were also examined

Results: Of the 26 subjects, 16 (61.5%) were females, 10 [38.5%] were Black/African-American, 14 [53.8%], APOE ε4 carriers, and 3 [11.5%] individuals were Aβ+. The mean (SD) age was 66.5 (4.6) years, BMI was 26.0 (10.6) kg/m**2, and education was 16.4 (2.5) years. There was no clear association of TST with cortical tau in the combined meta-region involving the entorhinal and inferior temporal lobe (meta-analytic estimate: β = −0.01[0.01]; 95% CI, −0.04 to 0.03, P =.16). However, TST by APOE ε4 interaction was significant for the combined meta-region (meta-analytic estimate: β = −0.06[0.02]; 95% CI, −0.11 to -0.01, P =.03), right inferior temporal β [right] = −0.02[0.01]; 95% CI, −0.04 to −0.00, P=.02), and bilaterally in the superior parietal β [left] = −0.20[0.08]; 95% CI, −0.37 to −0.02, P=.03), β [right] = −0.03[0.01]; 95% CI,−0.04 to −0.00, P=.04), cortical regions, suggesting a synergistic effect. TST by APOE ε4 interaction with regional tau trended in the left precuneus (β [left] = −0.01[0.01]; 95% CI, −0.02 to 0.00, P=.07) and the left inferior temporal β [left] = −0.02[0.01]; 95% CI, −0.03 to 0.00, P=.08) cortical regions. TST by Aβ interaction was not associated with regional tau.

Conclusion: APOE ε4 and sleep duration exhibited synergism in association with higher regional tau in cognitively-normal older adults. Larger studies are needed to delineate mechanisms and strata specific estimates.

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1033

ASSOCIATION OF THE CARDIOPULMONARY COUPLING SLEEP SPECTROGRAM WITH INCIDENT PARKINSON'S DISEASE IN OLDER MEN

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Introduction: The cardiopulmonary coupling (CPC) sleep spectrogram is an increasingly recognized measure of sleep quality which integrates sleep, autonomic drive, and respiration. Specifically, CPC is an estimate of the sleep state modulated synchronization and coupling between heart rate variability and respiration. Those with Parkinson's disease (PD) have been shown to exhibit alterations in CPC and have higher rates of sleep disturbances, respiratory abnormalities, and autonomic dysfunction. However, little is known about the longitudinal association of CPC with incident PD in community-dwelling older men.

Methods: We studied 2859 men (mean [SD] age = 76.2 [5.4] years) without PD who underwent polysomnography between 2003 and 2005 and were followed until 2016 for incident self-reported PD as part of the Osteoporotic Fractures in Men (MrOS) prospective study. CPC was calculated from the electrocardiogram (ECG) during rapid eye movement (REM) sleep, N2 and N3 (N2N3) stages of non-REM sleep, and across the whole night. CPC metrics included high, low, and very low frequency coupling (HFC, LFC, and VLFC, respectively). Ratios of the 3 power bands were computed to assess deviation from or concordance with typical stage specific CPC patterns. Associations between tertiles of CPC metrics and incident PD were assessed using multivariable logistic regression.

Results: During 11 years of follow-up, 64 incident PD cases were identified. After adjustment for covariates including age, comorbidities, and apnea-hypopnea index (AHI), men in the lowest tertile of VLFC/(LFC+HFC) during REM sleep had approximately twice the risk of developing PD [OR (95% CI) = 2.22 (1.20,4.35)] relative to men in the highest tertile. Whole-night and N2N3 CPC metrics were not associated with incident PD.

Conclusion: Disruption of the typical CPC pattern during REM, representing potential altered interactions between brain (sleep electrocortical activity), cardiac (heart rate variability) and respiratory output mechanisms, was associated with an increased risk of incident PD. Our findings may reflect a prodromal alteration of interactions between sleep subsystems, though future studies are needed to understand potential mechanisms linking CPC to incident PD.

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1034

ATTENUATED HEART RATE CHANGE AS POTENTIAL SLEEP DIGITAL BIOMARKER IN LEWY BODY DEMENTIA

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Introduction: Differentiation of Lewy body Dementia (LBD) from Alzheimer's disease (AD) is challenging due to overlapping clinical presentation. Symptoms associated with autonomic nervous system dysfunction are common in patients with LBD, likely associated with the accumulation of α-synuclein aggregates in the neurons and glial cells. We investigated whether spontaneous heart rate acceleration or deceleration measured by autonomic activation index (AAI) with a portable home sleep test can differentiate LBD from AD. We hypothesized that individuals with LBD will have attenuated AAI compared to those with AD.
Methods: We enrolled patients with LBD (n= 10) and AD (n=6), all of whom underwent a portable home sleep test for two consecutive nights. AAI was defined based on a 6 beats per minute increase or decrease in pulse rate compared to the previous or subsequent 10th second. Each participant's mean AAI was calculated after weighing the total sleep duration. Mean AAI, sleep efficiency, REM stage, and N3 were compared between the two groups.
Results: The mean (SD) age for the AD group was 78.5 (2.4) years old, and for the LBD, it was 70.4 (7.6). AAI was higher in AD than LBD group but differences were not statistically significant [24.1 (23.1) and 11.2 (10.6), p=0.3]. Percentage time spent in REM sleep was significantly higher in AD than LBD [18.3(4.3) and 8.4(8.2), p=0.007]. While N3 sleep state (%) was lower in AD than LBD [9.7(19.2) and 18.4(24.6), p= 0.4] and sleep efficiency (%) was higher in AD than LBD 72(0.1)and 70(0.2), p=0.8], these differences were not significant.
Conclusion: Heart rate change during sleep measured by AAI was lower in LBD patients (vs. AD) as hypothesized, but the differences were not significant, likely due to the small sample size. Percentage time spent in REM sleep was lower in LBD compared to AD. Future studies are necessary to determine if attenuated heart rate change during sleep can be a used as a digital sleep biomarker to differentiate between LBD from AD.
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AUTOMATED ANALYSIS OF REM SLEEP WITHOUT ATONIA IN THE LEWY BODY DISEASE SPECTRUM

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Introduction: Quantitative rapid eye movement (REM) sleep without atonia (RSWA) recorded during polysomnography (PSG) represents loss of normal REM sleep atonia. RSWA is the neurophysiologic signature of REM sleep behavior disorder (RBD). Visually scored RSWA is a candidate biomarker for synucleinopathies. However, visual RSWA scoring requires expert scoring, limiting widespread application. We comparatively analyzed RSWA in DLB and iRBD using the automated Ferri REM Atonia Index (RAI).
Methods: We quantitatively analyzed the RAI in 17 DLB and 20 iRBD patients, compared to 20 controls using Hypnolab Software for Sleep Analysis (SWS Soft, Colognola ai Colli, Italy). PSG data were converted to European Data Format (.EDF), and the submentalis surface electromyogram (EMG) signal was notch-filtered at 60 Hertz and rectified. Automatically calculated RAI scores were comparatively analyzed across groups (DLB, iRBD, controls) using Kruskal Wallis H tests for group comparisons, and regression analyses determined relationships between diagnosis, age, and sex. Logistic regression ROC determined optimal RAI for distinguishing iRBD from DLB. When interpreting RAI, lower values represent greater amounts of RSWA, and higher values represent more normal REM atonia.
Results: Median age was no different between DLB (72.6 years), iRBD (69.4 years), and controls (68.0 years). The DLB group consisted of 16 men and one woman, the iRBD group had 18 men and 2 women, and controls were comprised of 16 men and 4 women. Median RAI was lowest in DLB (0.32), intermediate in iRBD (0.84) and highest in controls (0.96), indicating a gradient in RSWA amounts from DLB patients (highest) to controls (lowest). Regression demonstrated diagnosis independently predicted RAI, controlling for age and sex (adjusted R2=0.64, p=0.0001). The RAI that optimally distinguished iRBD from DLB was 0.48 (specificity 85%, sensitivity 76%, AUC=0.88).
Conclusion: The RAI demonstrated a clear gradient throughout the Lewy body spectrum; highest (indicating lowest RSWA amounts) in controls, intermediate in iRBD, and lowest (indicating greatest RSWA) in DLB. The RAI is a promising, time efficient and broadly applicable candidate biomarker for DLB and iRBD. Automated quantitative RSWA could be a valuable tool for deep phenotyping throughout the Lewy body disease spectrum.
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1036

BEYOND BRAIN FOG: A SOCIAL LISTENING ANALYSIS OF IMPAIRED COGNITIVE FUNCTIONING IN SLEEP DISORDERS

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Introduction: To best support a rare-disease community, it is imperative to understand the unique symptoms and challenges associated with their condition. In recent years, the experience of "brain fog" has been discussed across sleep-disorder

communities, including narcolepsy and idiopathic hypersomnia (IH); however, the term "brain fog" is a vague descriptor that might represent several experiences. Here, we explored experiences with brain fog across sleep communities. The primary goal was to identify cognitive challenges associated with brain fog. Impacts on daily living were also characterized.
Methods: We analyzed conversations in 2 online sleep disorder communities: narcolepsy (a private Facebook group, PWN4PWN; and a public subreddit, r/narcolepsy) and IH (a public subreddit, r/idiopathichypersomnia). Posts/comments were explored using a natural language processing (NLP) engine designed to recognize and categorize clinical language on social media. Conversations mentioning brain fog across communities were isolated for analysis. Odds ratios were calculated to identify clinical concepts associated with brain fog conversations (vs other conversations). Last, conversations were subjected to topic modeling, a process which reveals common conversational themes in community discussions.
Results: Narcolepsy and IH communities contributed 355,028 posts/comments from 2011-2023. The NLP engine extracted concept mentions across communities. Brain fog mentions experienced the largest increase from 2014-2017. The concept most associated with brain fog was "memory impairment". Another strongly associated cognitive concept included "inattention". Sleep-related concepts (e.g., "difficulty sleeping") were also associated with brain fog. Topic analysis showed converging support for these findings by identifying topics such as "memory issues" and "ADHD". Topics related to daily living included "school" and "workplace".
Conclusion: The experience of brain fog is shared across multiple sleep communities. In both narcolepsy and IH groups, brain fog experiences preceded the COVID-19 pandemic, with a substantial increase in mentions before 2020. Brain fog conversations were significantly associated with memory and attention difficulties, similar to other disorders. The association with sleep-related concepts appears to be unique in this patient group. These findings suggest brain fog may impact certain mental processes more than others and may be exacerbated by poor sleep quality. The daily impact of brain fog was illustrated by conversations centering around school and workplace experiences.
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1037

COMORBID INSOMNIA AND SLEEP APNEA IN EPILEPSY PATIENTS

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Introduction: Obstructive Sleep Apnea (OSA) is very common in patients with epilepsy disorders, especially in refractory cases. Both epilepsy patients and OSA patients can have complaints of insomnia as a prevalent symptom. Additionally, about 30% of patients with chronic insomnia have OSA, and nearly 40% of people with OSA also have insomnia symptoms. This is known as Comorbid Insomnia and Sleep Apnea (COMISA). The objective of this study was to describe COMISA in patients with epilepsy.
Methods: We performed a retrospective observational study of adult patients with epilepsy with a concomitant diagnosis of OSA who presented for clinical visits between 10/01/2022 and 09/30/2023 at a sleep center. 57 patients were identified with either seizures or an epilepsy disorder. Among those patients, 9 patients were found to have concurrent OSA and met study criteria. Electronic medical records were reviewed to identify those with insomnia complaints.
Results: Preliminary results of the study are presented. Most patients were female (n=6, 66.7%%), with a mean age of 36.33 + 0.7 years. On review of the patients' polysomnography, the mean apnea hypopnea index (AHI) was 15.63 + 10.74/hour, total sleep time (TST) was 342.05 + 104 minutes, and sleep efficiency was 64.92 + 0.21%. Four patients (44.4%) had COMISA. Among the patients with COMISA, the mean AHI was 16.65 + 10.74%. The mean TST (239 + 104.65 minutes) and mean sleep efficiency (45.78 + 21.6%) were significantly reduced and mean sleep latency was high (37.65 + 0.42 minutes).
Conclusion: Based on our retrospective screening, the prevalence of insomnia in patients with OSA and seizure disorders is quite high. Further large retrospective and longitudinal studies are required to identify the patients at risk of COMISA in epilepsy with the help of clinical and polysomnographic evaluation.
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1038

C-REACTIVE PROTEIN AS A RISK PREDICTIVE MARKER FOR SLEEP-RELATED ALZHEIMER'S DISEASE IN BLACKS

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Introduction: Sleep is regulated by the microbiota-gut-brain axis, which plays a critical role in amyloid beta (Aβ) production and clearance; two key processes in the progression of sleep-related Alzheimer's disease (SRAD). C-reactive protein (CRP) is an inflammatory biomarker correlated with Aβ levels in SRAD. Although Blacks are disproportionately affected by SRAD, a paucity of knowledge exists regarding effective early detection and prevention of this disease in this population. This study investigated the levels of CRP in Black participants with subjective Sleep apnea (SA) to determine what indicators or thresholds may serve as a risk predictive marker for Aβ blood biomarker screening for SRAD.
Methods: Blood from a total of 104 Blacks enrolled in two NIH-funded community-based sleep studies, ESSENTIAL and MOSAIC, was collected from January 2020 until October 2023. CRP levels were accessed according to clinical standards in ranges of normal or minor elevation, moderate elevation, marked elevation, and severe elevation. Frequency distributions and analyses were performed using SPSS29.
Results: Twenty-one participants self-reported an existing SA diagnosis; of which 19% had CRP levels at 0.3 - 1.0 mg/dL, 62% at 1.0 - 10.0 mg/dL, 19% at >10.0 mg/dL, and none at >50.0 mg/dL. Of the 83 participants without SA, 31% had CRP levels at 0.3 - 1.0 mg/dL, 61% at 1.0 - 10.0 mg/dL, 7% at >10.0 mg/dL, and 1% at >50.0 mg/dL. In total, 81% of participants with subjective SA had CRP levels above minor elevation, while 69% of participants without subjective SA had levels above minor elevation, showing a 10% difference in elevated CRP levels between both groups. These results suggest that SA can lead to greater levels of inflammation among Blacks.

Conclusion: A 10% difference in elevated CRP levels of participants with and without SA diagnosis may suggest that undiagnosed participants could be at risk for SA. Identifying factors that predict blood Aβ levels such as CRP may lead to a cost-effective, SRAD specific prescreening panel to identify patients at higher risk of SRAD, and aid risk stratification in Blacks. Future research is needed to further explore this area.

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1039

DIFFUSION IMAGING MARKERS OF GLYMPHATIC FUNCTION IN VETERANS WITH SLEEP DYSFUNCTION AND MILD TRAUMATIC BRAIN INJURY

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Introduction: We investigated the impact of sleep disturbances and past mild traumatic brain injuries on the glymphatic system (GS), an essential cerebral network responsible for fluid exchange and solute balance, by employing a novel, non-invasive imaging technique, Diffusion Tensor Imaging Along Perivascular Spaces (DTI-ALPS).

Methods: Participants were 148 Veterans of post-911 conflicts enrolled in the Houston Translational Research Center for TBI and Stress Disorders (TRACTS) who completed MRIs, the Pittsburgh Sleep Quality Index, Boston Assessment of TBI-Lifetime, and Clinician-Administered PTSD scale for DSM-5. Individuals with moderate or severe TBI were excluded. We analyzed potential relationships between the DTI-ALPS index, a ratio of diffusion measures at a priori regions of interest, and sleep parameters derived from the PSQI, concussion severity (grades I-III), demographic factors, and PTSD severity.

Results: Participants were aged 36.5±7.4 years, 8.6% were females, 55% were white, and 82.1% had mild TBI. DTI-ALPS negatively correlated with age (r=-0.189, p=0.021); correlations with PSQI global score, sleep efficiency, and total hours asleep were not significant. DTI-ALPS was significantly associated with concussion severity (p=0.042) and time to bed after 12:30 AM (p=0.038). After adjusting for age, grade III concussion severity and time to bed after 12:30 AM remained significant, but the interaction between them was not. There were no significant associations with components of the PSQI, PTSD, and other demographic variables.

Conclusion: Glymphatic flow is known to be affected by sleep, however, we found relatively modest effects of sleep on DTI-ALPS, which may mean that it may not be sensitive to detect cross-sectional measures of subjective sleep quality in awake participants. We observed both brain injury and time to bed to influence DTI-ALPs. Although brain injury is often associated with impaired sleep, these appear to be independent predictors of GS function in our cohort. Large-scale studies focusing on diurnal fluctuations of GS may advance our understanding of its role in long-term brain health.

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1040

IMPROVED CARE IN NEUROMUSCULAR MULTIDISCIPLINARY CLINIC WITH SLEEP MEDICINE INCORPORATION

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Introduction: Neuromuscular multidisciplinary clinical care models are becoming common in the management of the neuromuscular disease. Updated clinical practice guidelines emphasize the role of polysomnography (PSG) in determining the need for early non-invasive ventilation (NIV) in these patients to improve quality of life and disease course. Despite this and the high prevalence of comorbid sleep disorders, sleep medicine is not included in the standard model for these clinics. We sought to (1) define and improve the rate of PSG acquisition, and (2) improve detection of sleep-related comorbidities in this high acuity population with the addition of sleep medicine to an established neuromuscular multidisciplinary clinic.

Methods: Sleep medicine physicians joined a pre-established multidisciplinary clinic aimed to treat neuromuscular disease and related comorbidities. The multidisciplinary clinic was attended monthly from January to December 2023. Patients were evaluated for sleep disorders using clinical interviews and standardized sleep questionnaires. Patients were referred to the sleep disorders center to obtain diagnostic in lab video PSG with carbon dioxide monitoring. When sleep disordered breathing was detected, patients were offered therapy and followed clinically.

Results: A total of 12 neuromuscular patients (6 male (50%), average age 52) were evaluated, with75% (n=9) having no prior sleep medicine encounter. Only 50% had completed a PSG prior to sleep medicine evaluation. After sleep medicine evaluation, PSG acquisition rate improved to 100%. Obstructive sleep apnea (OSA) was detected in 83.3% (n=10, average AHI 26.6) of patients, with 8 meeting criteria for moderate-severe OSA, and 2 having nocturnal hypoventilation despite normal pulmonary function testing. The average sleep efficiency was 70%. The average Insomnia Severity Index was 8.25 and 58.3% (n=7) were diagnosed with chronic insomnia disorder. The average Epworth Sleepiness Scale was 7.6, with 41.6% (n=5) reporting excessive sleepiness.

Conclusion: Acquisition of clinically recommended PSG improved to 100% from our intervention. The detection of previously undiagnosed OSA, insomnia, and nocturnal hypoventilation is clinically meaningful. Sleep medicine incorporation into the neuromuscular multidisciplinary clinical care model contributes to improved patient care.

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1041

INCREASED DELTA-GAMMA COUPLING DURING PHASIC REM SLEEP IN ISOLATED RBD

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Introduction: This study examines the phasic and tonic states of REM sleep with a focus on idiopathic rapid eye movement sleep behavior disorder (iRBD), which is characterized by REM sleep without atonia and is thought to be a precursor to alpha-synucleinopathies. By examining specific EEG dynamics associated with dreaming, specifically delta and gamma power during phasic REM sleep states and their correlation with iRBD characteristics, we aim to develop a comprehensive understanding of dream enactment.
Methods: In-depth analysis was performed using polysomnography (PSG) and 21-channel EEG data from 13 iRBD patients and 10 controls who had been drug-free for six months and had not progressed to alpha-synucleinopathy. REM sleep states were categorized into phasic and tonic states based on eye movements, and the Kullback-Leibler modulation index was used to assess phase-amplitude coupling (PAC) and calculated phase-locked amplitudes (PLA) to determine interphase coupling. Gini coefficients were calculated to identify within- and between-component imbalances, and extensive statistical analysis was performed using permutation cluster analysis, repeated measures analysis of variance, Mann-Whitney U tests, and correlation assessments to identify differences and relationships.
Results: The results showed a significant increase in delta-gamma coupling during phasic REM sleep in RBD compared to controls (FDR $p < 0.0001$). A detailed comparison of the delta signal component, the component in which the imbalance was found (FDR $p < 0.0001$), at different spatial locations revealed distinct patterns of delta-gamma coupling, with significant phase-amplitude coupling (PAC) observed in frontal and parietal cortex. These results showed a clear linear relationship (FDR $p < 0.0001$), with notable correlations with the RBDQ-KR (FDR $p < 0.0001$) and the REM atonia index (FDR p=0.0003). The average area under the ROC-AUC curve for separating the RBD group from the control group based on PAC values was 0.88.
Conclusion: The study significantly highlights the role of EEG metrics, especially the coupling of delta and gamma oscillation during REM sleep, as key indicators of dream-related enactment in iRBD. The strong correlations with clinical indices not only underscore the diagnostic value of these EEG measures but also suggest their potential to revolutionize the diagnosis and understanding of iRBD.
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1042

INFLUENCE OF OSA SEVERITY ON THE ASSOCIATION OF GLOBAL AMYLOID AND REGIONAL TAU-PET BURDEN

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Introduction: We examined the association of OSA severity with regional tau-PET deposition in clinically normal individuals, as a function of β-amyloid (Aβ), race and apolipoprotein E (APOE) ε4 status.
Methods: Cross-sectional analysis of preliminary data from 26 (16 Whites and 10 Blacks matched on AHI4%, age, BMI and educational level) community-dwelling cognitively normal older-adults with baseline tau ([18F] PI2620) and Aβ ([11C] PiB) PET scans. OSA severity was characterized using AHI4%. Linear mixed effects models controlling for Aβ, age, sex, race, BMI and other sleep variables, examined a main association of OSA with regional tau and a meta-region of interest, which was a composite of regions in the temporal lobe. Interactions between OSA*Aβ, OSA*Race, and OSA*APOE ε4 on these regions were also examined.
Results: Of the 26 subjects, 16 (61.5%) were females, 14 APOE ε4 carriers [53.8%], and 3 individuals [11.5%] were Aβ+. The mean (SD) age was 66.5 (4.6) years, BMI was 26.0 (10.6) kg/m**2, and education was 16.4 (2.5) years. OSA severity was associated with cortical tau in the combined meta-region involving the entorhinal and inferior temporal lobe (meta-analytic estimate: β = −0.12[0.05]; 95% CI,−0.23 to −0.00), and regional tau in the superior parietal (β [left] = −0.05[0.02]; 95% CI,−0.10 to −0.01; β [right] = −0.05[0.02]; 95% CI,−0.09 to −0.00), left parahippocampal (β = −0.05[0.02]; 95% CI,−0.09 to −0.00), and right precuneus (β = −0.04[0.01]; 95% CI,−0.06 to −0.01) cortical regions, P <= .04 for all. A race by OSA severity interaction was significant for the left superior parietal (β [White, AHI4%] = −0.06[0.01]; 95% CI,−0.12 to −0.00), and left parahippocampal (β [White, AHI4%] = −0.01[0.03]; 95% CI, −0.03 to −0.00) and (β [Black, AHI4%] = −0.04[0.01]; 95% CI,−0.06 to −0.00) regions, P <= .05 for all. OSA severity by APOE ε4 interaction was not associated with regional tau.
Conclusion: OSA severity is associated with regional tau-PET deposition in clinically normal individuals, regardless of APOE ε4 status, and this association differed by race in certain brain regions. These findings highlight OSA as a unique disease model for examining racial differences in Alzheimer disease risk.
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1043

PREVALENCE OF SLEEP PARALYSIS IN MEDICAL STUDENTS ACROSS INDIA- A CROSS SECTIONAL STUDY

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Introduction: Sleep paralysis is a condition that has been on the rise in recent years, occurring during the pre or post sleep stages. While there is no known direct cause of sleep paralysis, studies have shown a number of potential causes, including poor quality of sleep, alcohol use, exposure to stressful events, anxiety disorders, and a family history of the illness. The purpose of this study was to assess the prevalence of sleep paralysis among medical college students in India and identify factors associated with the condition.
Methods: A cross-sectional study involving 155 medical students was done involving the students to fill the questionnaire anonymously. The questionnaire was made using data from the Unusual Sleep Experiences Questionnaire (USEQ) and distributed nationwide among medical students using an online Google Form. Power analysis is done using CDC EpiInfo software, Version 7.2.5. Statistical analysis is done using StataCorp. 2021. Stata Statistical Software: Release 17. College Station, TX: StataCorp LLC.
Results: Out of 155 students, 145 students (93.55%) participants consented to participate in the study. 76 medical students (52.4 %) reported having an episode of sleep paralysis in their lifetime. Out of those students, 39 (51.3%) were males, while 37 (48.6%) were females. A statistically significant association between medical students suffering from psychological illness and sleep paralysis was established, with 32.4 % of students suffering from anxiety and 22.1 % of individuals reporting concurrent depression. 46% of the individuals had only one or two episodes of sleep paralysis episodes in their lifetime while 54% had recurrent episodes of sleep paralysis. Majority (76%) of the participants do not indulge in recreational drug usage. Terror (56%) and Paralysis (54%) were the most commonly reported sensations by the individuals.
Conclusion: This study divulges that more than half of the medical students have suffered from sleep paralysis. In addition to it, students suffering from psychological illnesses were at increased risk of having sleep paralysis. In conclusion, this study highlights the need for increased awareness and education about sleep paralysis, especially among medical students. It also emphasizes the importance of addressing psychological issues and sleep-related disorders to reduce the risk of sleep paralysis.
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1044

RELATIONSHIP BETWEEN CORE AUTISM SYMPTOMS AND SLEEP DISTURBANCES IN YOUTH WITH AUTISM: A LATENT CLASS ANALYSIS

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Introduction: Previous studies have used cluster analysis to clarify diagnostic heterogeneity of autism, but have been limited to identifying subgroups of autism on the basis of core symptoms rather than sleep problems. The present study examined the relationship between core autism symptoms and sleep problems in children and adolescents with autism spectrum disorder (ASD).
Methods: 1466 patients (1–18y, M=6.4±3.6; IQs of 8–146, M=88.9±27.25; 81.2% male, 89.0% white) diagnosed with ASD. Dimension reduction via principal component analysis (PCA) was performed on the 10 sleep items from the Pediatric Behavior Scale. Latent class analyses (LCA) was used to determine phenotypes characterized by core ASD symptoms (social interaction, perseveration, somatosensory disturbance, atypical communication/ development, mood, and selective attention/safety awareness), and sleep dimensions accounting for age, gender, IQ, and medication use.
Results: Three clusters with distinguishable sleep factors were retained from the PCA, with eigenvalues >1, with adequate goodness-of-fit (TLI=0.91;RMSEA=0.075); disturbed sleep (trouble falling asleep, restless sleep, wakes often, nightmares, and talks/walks/or cries in sleep), insufficient sleep (sleeps less, wakes early), and, hypersomnolence (drowsy/sleepy, sluggish/slow-moving, sleeps more). LCA revealed a 3-class (AIC=29164.00;BIC=29594.00;sBIC=29334.00) and 4-class model (AIC=28986.00;BIC=29489.00;sBIC=29184.00), with adequate fit. Based on IC measures, the 4-class model yielded the best model fit, with acceptable entropy (0.856). Based on conceptual grounds and considering all model fit statistics, the 4-class model was chosen. Using Class 3 (N=708;50.7%) as the reference group, Class 1 (N=71;5.1%) was categorized by more problems with social interactions, disturbed sleep, hypersomnolence, older age and increased medication use. Class 2 (N=367;26.3%) was categorized by less severe autism symptoms, particularly problems with selective attention/safety awareness, overall sleep problems, older age and higher IQ. Class 4 (N=251;18.0%) was categorized by more problems with perseveration and somatosensory disturbance, disturbed and insufficient sleep, younger age and increased medication use. Gender was not a significant covariate.
Conclusion: Using LCA we found four distinct patterns of core autism symptoms and sleep problems differing in terms of age, IQ, and medication use. This study provides strong evidence for phenotyping and targeting sleep as a standard part of therapeutic intervention in individuals with autism.
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1045

SLEEP DISORDERS IN PEDIATRIC PATIENTS WITH AGENESIS OF THE CORPUS CALLOSUM

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Introduction: Agenesis of the corpus callosum (ACC) is a complete or partial absence of the corpus callosum arising from disruption of brain development. There is limited information about sleep in children with ACC. We aim to describe the sleep architecture and respiratory parameters of children with ACC.
Methods: Retrospective study of 20 patients with ACC who had polysomnography (PSG) between 2000-2023. Demographic data, BMI or weight for length (percentile), associated conditions, and PSG findings were collected. Sleep quality was compared to the National Sleep Foundation's guidelines. Poor sleep quality indicators were sleep latency >45 min, sleep efficiency (SE) < 75%, N1 ≥20%, N2 >81%, N3 ≤5% for 14-17 years, N3 ≤10% for < 14 years, REM ≤10% excluding 6-13 year-olds, or arousal index >10/h. Fisher's exact test or unpaired t-test was used to compare groups.
Results: Average age was 5.9 ± 5.4 years old, and 12/20 patients were male. 6/20 were overweight/obese. 14/20 had

complete ACC, and 6/20 had partial ACC. 8/20 had seizures. 15/20 had ≥1 poor sleep quality indicator, notably decreased SE (45%) , decreased REM (53%), and increased arousals (45%). Between complete and partial ACC, there was no difference in presence of ≥1 poor sleep quality indicator (p= 0.61), SE (p=0.34), REM (p=0.28), and arousals (p=1). Sleep quality was similar between seizure and no seizure groups (p=0.60). 11/18 had obstructive sleep apnea (OSA); 5/11 also had central sleep apnea (CSA). 1/20 had CSA alone. Only 1 with OSA was overweight. Excluding patients with tracheostomies, there was no difference in OSA between those with complete and partial ACC (p=1) or those with and without seizures (p=0.16). SpO2 baseline was 95 ± 2%; SpO2 nadir was 85 ± 0.1%. 4/20 had ≥5 minutes of total sleep time (TST) with SpO2 < 90%. PETCO2 maximum was 48 ± 5 mmHg; none had PETCO2 >50mmHg for >25% of TST.

Conclusion: Children with ACC have poor sleep quality, and many have OSA. There was no difference in sleep quality or presence of OSA between those with complete and partial ACC. Our study supports the need for screening of sleep-related disorders in patients with ACC.

Support (if any):

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1046

SLEEP PROBLEMS PREDICT PAIN ONE MONTH AFTER DIAGNOSIS AND TWELVE MONTHS LATER AMONG PEOPLE WITH MULTIPLE SCLEROSIS

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Introduction: Sleep problems and pain are commonly experienced by people with multiple sclerosis (PwMS). This study aimed to determine whether sleep problems assessed one month after receiving an MS diagnosis associated with pain intensity and/or pain interference at this time or predicted these pain outcomes 12 months after diagnosis.

Methods: This secondary analysis used data from the prospective observational LAND ('Life After New Diagnosis') study and was restricted to those with an MS diagnosis who provided complete Medical Outcomes Study (MOS) Sleep Scale questionnaire data. Linear regression was used to quantify associations between sleep variables (MOS-Sleep problems index and dimension scores 'sleep disturbance', 'sleep adequacy', and 'awaken short of breath or headache') and pain intensity (past-week average, 0-10 Numeric Rating Scale) and pain interference (PROMIS Short Form 6a), adjusted for age, sex, number of years of education, comorbidities, and, in longitudinal models, baseline level of the outcome (pain intensity or pain interference). A p value < 0.05 was used to determine statistical significance.

Results: The sample (N=174) was predominantly female (69.5%) and white (86.2%), with a mean age of 39.8 years (standard deviation 11.2). The most common MS disease course was relapsing/remitting (52.3%); 35.6% were yet to be categorized. One month after diagnosis, there was a significant, cross-sectional association between MOS-Sleep problems index score and pain intensity (B=0.04, 95% confidence interval (CI): 0.02-0.05, p< 0.001) and pain interference (B=0.17, 95% CI: 0.11-0.24, p< 0.001). Dimension scores for 'sleep disturbance', 'sleep adequacy', and 'awaken short of breath or headache' were also significantly associated with the pain outcomes at this time. In longitudinal analyses, MOS-Sleep problems index score one month after diagnosis predicted pain intensity (B=0.02, 95 %CI: 0.007-0.04, p=0.003) and pain interference (B=0.11, 95% CI: 0.05-0.17, p< 0.001) 12 months after diagnosis. Higher scores for 'sleep disturbance' and 'sleep adequacy' one month after diagnosis also predicted both pain outcomes 12 months after diagnosis.

Conclusion: As a modifiable factor, sleep presents a viable constituent of multicomponent pain management for PwMS. Research is needed to determine whether improving sleep reduces pain in this population.

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1047

SLEEP FRAGMENTATION PREDICTS DIMINISHED PROCESSING SPEED IN NON-DEMENTED ELDERLY FROM THE CRETAN AGING COHORT

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Introduction: Processing speed is an early index of cognitive decline in elderly. Also, sleep quality predicts memory deficits in this age group. However, the relationship between sleep fragmentation and processing speed remains controversial. Our aim was examine the longitudinal associations between sleep quality and processing speed in non-demented community dwelling elderly.

Methods: A sub-sample of 148 participants diagnosed with Mild Cognitive Impairment (MCI;n=79) or cognitively non-impaired (CNI;n=69) from the Cretan Aging Cohort, a large population-based cohort of 3,140 older adults (>60 years; baseline) were followed-up 8 years later (follow-up). Mean age at baseline was 74.9±6.33 and 70.4 ±6.24 years for MCI and CNI persons. Processing speed was assessed based on age and education adjusted z-scores of the Symbol Digit Modality Test. Sleep fragmentation (wake after sleep onset; WASO) was assessed using a 3-day actigraphy at baseline and follow-up. Change between the two time points was calculated using paired sample t-tests. The direct and indirect effects of baseline WASO on subsequent processing speed after controlling for sociodemographic covariates were estimated using panel models in AMOS.

Results: Average WASO among MCI and CNI participants was 80.6±41min and 72.3±31.2min; p=0.1 and 75.7±34.8min and 59.3±20.6min; p< 0.001 at baseline and follow-up, respectively. Average processing speed decreased between the two measurement points (CNI: 0.23±0.97 and -0.40±1.04; p< 0.001

and MCI: -0.75±0.60 and -1.09±0.72; p< 0.001 at baseline and follow-up, respectively). Baseline WASO directly predicted processing speed (β=-0.201; p=0.04) among MCI persons, while WASO at follow-up fully mediated the relationship between baseline WASO and subsequent processing speed (β=-0.098; p=0.004) in the CNI group.
Conclusion: Sleep fragmentation predicts diminished processing speed among non-demented elderly. Given the significance of processing speed on cognitive function, interventions improving sleep quality in elderly may prevent/delay cognitive decline.
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1048

AMBULATORY SLEEP EEG IN POST-STROKE HOSPITALIZATION

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Introduction: An important function of sleep is neuroplasticity, which is essential to functional recovery after stroke. However, inpatient acute care settings may not be conducive to restful and consolidated sleep. The goals of the present study were to test the feasibility of using wearable technology to objectively quantify sleep during inpatient stay in the first few days of hospitalization post stroke and examine relations of sleep quality and architecture with stroke severity.
Methods: Data collection is ongoing, preliminary analyses are based on 8 patients (5F/3M, 41-78 yrs, mean age=61.7 yrs). A headband style EEG acquisition device (Sleep Profiler) was used for one night (0-8 days following a first-ever stroke, mean=3 days) either in ICU or neurology inpatient floors. Sleep was scored based on standard AASM criteria. The National Institute of Health Stroke Scale (NIHSS) was administered to assess stroke/disability severity.
Results: We observed great variability in sleep duration (2.1-6.2 hrs, mean=4.1 hrs), sleep efficiency (29-81%, mean=51%) and increased time spent in N3 (compared to standard sleep architecture; 21.2-72.8%, mean=41.7% of total sleep time). Stroke severity correlated with WASO (r=.82, p=.02) and time spent in supine position after sleep onset (r=.83, p=.02).
Conclusion: While preliminary, these findings identify profound sleep restriction and fragmentation experienced by stroke survivors during the first few days of hospitalization. Further, stroke severity predicts increased sleep fragmentation, possibly due to more intensive medical care required. Future plans involve examining long-term cognitive and functional outcomes in patients to test the hypothesis that better sleep during the acute phase of stroke enhances recovery.
Support (if any): Iowa Neuroscience Institute Research Program of Excellence

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1049

ARE THE AASM SCORING RULES FITTING FOR THE SLEEP OF PATIENTS WITH CHRONIC DISORDERS OF CONSCIOUSNESS?

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Introduction: From a neurobiological perspective, consciousness and sleep are strictly related. It is known that regular sleep patterns may reflect the preservation of brain functions. Detailed sleep assessment Disorders of Consciousness (DOC) patients is a controversial issue.
Methods: Twenty-two patients (11 females and 11 males, mean age 52.2 + 14.5 years) with prolonged or chronic DOC were consecutively enrolled as part of a national, multicentric clinical trial aimed at evaluating the tolerance and the efficacy of treatments for sleep disorders in DOC patients. All the patients underwent to a 24h polysomnography (PG) visually inspected in order to assess their sleep stages on the basis of the AASM scoring rules.
Results: All the patients except one slept for at least 4 hours. Ten out of 21 (47.6%) patients showed a sleep lacking the features necessary for scoring; nor spindles neither K-complexes were present, the delta waves, if present, were localized; the polygraphic features of REM stage were absent. In our cases, sleep differed from wakefulness only by the decrease in muscle tone and by the reduction of eye movements and muscle artifacts on the EEG, as well as by the modification in the heart rate and heart-rate variability. Furthermore, in 4 out of 10 DOC patients with "indistinct" sleep, EEG pattern was characterized by very low voltage activity (< 20 microV), similar to what is observed in cases of deep sedation.
Conclusion: Our data push in the direction that a standardized sleep assessment procedure in DOC should be stabilized.
Support (if any): This research was funded by the Italian Ministry of Health GR-2016-02365049—Pilot Study on sleep pathologies treatments in patients with Vegetative and Minimally Conscious State diagnosis for improving Consciousness level: the STRIVE project.

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1050

SUPPORTING PATIENT SAFETY WITH OXYBATE THERAPY: A SURVEY OF PATIENTS AND PRESCRIBERS

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Introduction: Low-sodium oxybate (LXB; Xywav®) and high-sodium oxybate (SXB; Xyrem®) are approved to treat cataplexy or excessive daytime sleepiness in patients ≥7 years of age with narcolepsy; LXB is also approved for idiopathic hypersomnia in adults. Both are available through the same manufacturer's Risk Evaluation and Mitigation Strategy (REMS) program under the US Food and Drug Administration, where prescribers and patients receive training and educational materials containing important information about the significant risks, safe handling, and storage of LXB and SXB. The Knowledge, Attitude, and Behavior survey was conducted to document and assess their level of awareness regarding important information about LXB and SXB communicated through the REMS.
Methods: Internet, telephone, and paper surveys were conducted between October 27, 2022 and February 26, 2023. Survey questions and statements tested each group's understanding of REMS Key Risk messages (risks associated with LXB and SXB, risk of abuse, dosing and safe handling). Surveys considered LXB and SXB jointly.
Results: Surveys were completed by 3152 patients and 273 prescribers. Most patient respondents correctly identified risks related to taking LXB and SXB at recommended doses (81.5%); most knew there is a risk of abusing LXB and SXB (89.6%) and correctly identified risks of taking too much of either (93.4%). Most prescriber respondents correctly recognized central nervous system depression (91.6%) and respiratory depression (79.5%) as risks associated with LXB and SXB; most were aware of patterns of misuse (99.3%) and drug-seeking behaviors (96.7%). For twice-nightly regimens, nearly all patients and prescribers, respectively, understood the first dose should be taken at bedtime (99.5%, 98.9%), the second dose should be taken 2.5–4 hours following the first dose (99.0%, 98.9%), and patients should remain in bed for both doses (99.4%, 95.9%). Most patients and prescribers responded correctly regarding proper storage (99.8%, 83.8%), reporting loss or theft (89.6%, 87.5%), and the legality of giving or selling LXB and SXB (98.9%, 99.6%).
Conclusion: Most patients and prescribers surveyed demonstrated understanding of the risks, dosing instructions, and safe handling of LXB and SXB communicated through the REMS to support safe and effective use.
Support (if any): Jazz Pharmaceuticals

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1051

A NOVEL SLEEP PILOT PROGRAM TO STREAMLINE CARE IN PATIENTS UNDERGOING JOINT REPLACEMENT

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Introduction: The presence of sleep disordered breathing can have a significant impact on a patient's perioperative risk. Diagnosis and treatment of obstructive sleep apnea (OSA) with positive air pressure (PAP) may help prevent post-operative complications. In this pilot program we hope to identify high risk patients early to help mitigate these risks.
Methods: We created a pilot program to help streamline patients undergoing joint replacement. In this program we identified high risk OSA patients, set them up with evaluation with our sleep medicine team and had them undergo standard of care sleep apnea testing. Once testing was completed patients received treatment if indicated.
Results: A total of 49 patients were evaluated 53% (26) of patients completed evaluation with the sleep medicine team. 8 out of the 49 patients completed their perioperative sleep apnea testing and had undergone their surgery. 9 out of the 49 patients did not complete their perioperative testing and had undergone surgery. Of the 9 that did not complete testing 4(44%) had readmission/visit to the emergency department (ED) post-surgery. 1 out of 8 (12%) who did complete testing had a readmission/visit to the ED. The average AHI of patients who completed testing was 14.67.
Conclusion: Early identification and intervention of patients with OSA may lead to less post operative readmissions/ED visits in patients undergoing joint replacement. Of note only 53% of patients completed evaluation with the sleep medicine team. This further identifies the importance of discussing with patients the risks that certain comorbidities may have when undergoing procedures. Although the sample size was small due to this being a pilot study, there was a 44% readmission/ED visit rate in patients who did not undergo testing or treatment for OSA. Further studies are needed to see if we can identify which patients with high suspicion for OSA are at greater risk for developing post operative complications to help streamline care and reduce hospital costs.
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1052

IMPACT OF CPAP ADHERENCE ON HOSPITALIZED PATIENTS DIAGNOSED WITH OSA ON HEALTHCARE UTILIZATION IN RURAL SETTINGS

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Introduction: Obstructive Sleep Apnea (OSA) is an increasingly prevalent condition with significant implications for cardiopulmonary health. Data suggests that early detection of OSA in hospitalized patients may improve outcomes. However, the effects of CPAP therapy have not been studied for hospitalized patients in a rural population. The primary purpose of this study is to examine the 1-year readmission, ED visit rate, and associated healthcare costs in hospitalized patients screened as high-risk for OSA, diagnosed, and started on CPAP therapy.
Methods: Through a retrospective review of 2042 patients from 08/2019 to 06/2023 in a registry of a hospital-based sleep medicine program, 786 patients were determined as high risk based on their results from apnea link. From there, 341 patients were selected based on their completion of an outpatient polysomnography (PSG), of which 293 were assessed for adherence of CPAP therapy. Composite end point of combined number of hospitalization and emergency department (ED) visits for 1-year

were recorded, further separating the outcomes that were cardiopulmonary in nature due to the CPAP's focus on those organs. Moreover, cost analysis was performed.
Results: Of the 293 assessed for adherence of CPAP therapy, 108 patients were adherent, while 185 were non-adherent. The mean age of patients evaluated was 58 years (12.82) and 57% were males. The average BMI of these patients was 39.7 (10.7). The mean AHI was 25.49 (26). Analyses showed that 1-year composite end point of hospital readmissions and ED visits were significantly higher in non-adherent patients compared to adherent patients. The hazard ratio was determined to be 1.24 with 95%CI 1-1.54(p=0.03). In the multivariate Cox model, adjusting for age and gender, the adjusted HR was 1.27 with 95%CI: 1.02 – 1.58 (p = 0.033). The one-year total cost of healthcare was significantly higher among non-adherent patients (p< 0.001).
Conclusion: Early detection of OSA in hospitalized patients in Appalachia and successful treatment may significantly lower healthcare utilization. These may have practical impact on quality of life and cost of healthcare delivery in rural hospitals.
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1053

PATIENTS' SLEEP PERCEPTION AND ITS CORRELATION WITH UNATTENDED AMBULATORY TESTING IN THE INPATIENT SETTING

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Introduction: Obstructive sleep apnea is an increasingly prevalent condition today, with many cardiopulmonary consequences. In the ambulatory setting when a patient reports poor sleep quality on the night of the study, repeat testing is usually sought out. Here, we examine the differences in AHI, ODI and comorbidities among patients who perceived they slept well versus patients who perceived they slept poorly and compare it to outpatient PSG follow up.
Methods: A retrospective chart review of 1351 patients enrolled in a formal hospital sleep medicine program between September 2019 and October 2022, was conducted. The sleep medicine team asked each patient how they perceived they slept that night, using three options: slept well, slept but not well, or slept very poorly. Patients who slept but not well and patients who slept very poorly were combined to make a category of slept poorly. From there, each patient's AHI, ODI, Stop-Bang score, ESS score and comorbidities were monitored.
Results: Of the 1351 patients 304 of these patients had outpatient follow up with PSG. The STOP-BANG score for patients who slept well and slept poorly was 5.17 and 5.48, respectively. In the patients who slept poorly, 73% had a mean AHI >5 on confirmatory PSG compared to 79% while inpatient. The patients who slept well, 79% had a mean AHI >5 on confirmatory PSG compared to 73% while inpatient.
Conclusion: The variables used to measure sleep apnea were not significantly different among patients who believed they slept well versus patients who believed they slept poorly. Current thought is that inpatient sleep medicine can lead to false positive results, as patients are sicker in the inpatient setting, leading to poorer sleep quality and disruption that could alter their unattended sleep study. In this retrospective chart review, there seemed to be little difference when comparing patients' hospital sleep studies to their outpatient ones. Only 22% of patients completed outpatient follow up. This needs further evaluation to see if streamlined care for the patients leads to better outcomes and cost-effective care.
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1054

SHOULD NON-SLEEPY PATIENTS SCREENED POSITIVE FOR SLEEP APNEA DURING HOSPITALIZATION BE TREATED?

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Introduction: Studies have shown that unrecognized sleep apnea in hospitalized patients results in increased hospital readmissions. However, it is unclear if poor outcome is limited to sleepy patients (ESS>10) or non-sleepy patients (ESS< 10) as well. In a formal hospital sleep medicine program, we evaluated the outcome of hospitalized patients diagnosed with OSA by monitoring their 6-month emergency department (ED) visits, hospital readmissions and mortality.
Methods: Patients were chosen based on two criteria: report of an ESS score and diagnosis of OSA through gold-standard outpatient polysomnography (PSG). During the period of August 2019 and June 2023, a total of 123 consecutive patients from a hospital sleep medicine service who were determined to have OSA and ESS ³ 10 were compared with a control of 123 patients with OSA and ESS < 10. Over the next 6 months, patients' ED visits, hospital readmissions and mortality were monitored. Demographics, comorbidity, and medication information were also recorded for these patients.
Results: The sleepy cohort had a mean ESS of 14 (SD 3) compared to the non-sleepy cohort of 6 (SD 2). The mean age and BMI for the sleepy versus non sleepy cohort were 57.6 (SD 12.8) versus 59.9 (SD 12) and 42 (10.8) and 39.6 (10.9), respectively. The sleepy cohort had an AHI from PSG of 26.2 (26.3) and the non-sleepy cohort had an AHI from PSG of 28.4 (23), the severity of sleep apnea was also similar. For patients with OSA and ESS > 10, the adjusted odds ratio for emergency department visits was 0.74 (95% CI 0.41-1.33). Similarly, the OR for the sleepy cohort for hospital readmission and mortality was 1.07 (CI 0.66-1.73) and 1.0 (CI 0.99-3.63).
Conclusion: Hospitalized patients who were diagnosed with OSA did not display significant differences in 6-month readmission, ED visit and mortality based on their ESS score. Given OSA's prevalence in the community, additional measures in addition to ESS scores must be taken to manage potential cases of OSA, thus improving clinical outcomes.
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1055

DEVELOPMENT OF A PROVIDER AND PATIENT-BASED SLEEP IMPROVEMENT RESOURCE FOR INPATIENT SETTING

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Introduction: Insomnia is common among hospitalized psychiatric patients and environmental challenges often increase the severity of sleep disturbances. Pharmacotherapy is often used to treat insomnia symptoms. Few studies have investigated ways to adapt CBT-I to inpatient populations.
Methods: A preliminary needs assessment was conducted at Stanford Hospital and Clinics Acute Inpatient Psychiatric units to identify barriers related to the use of non-pharmacological approaches to improve patients' sleep. We conducted unstructured interviews with staff members, including nurses, occupational therapists, psychologists, and psychiatrists. Based on themes that emerged from the interviews, we developed sleep improvement resources and subsequently refined them based on input from behavioral sleep medicine providers and the inpatient team.
Results: We developed the following three resources (1) a provider training and education resource, (2) a patient-facing handout, and (3) recommendations on the environment in the inpatient unit. Both the provider- and patient-facing resource consisted of context-sensitive CBT-I recommendations: psychoeducation about sleep regulation, counter control, alerting strategies, strategic napping, daytime activities that support sleep, developing a wind down and morning routine, and optimizing the sleep environment (e.g., utilizing earplugs, eye masks or extra blankets). Additionally, several recommendations were included to address modifiable environmental factors at the unit-level. These included increasing consistency with unit light and wake time schedule, nursing staff to perform visual checks to minimize disrupting patients' sleep, designated quiet time, dimmable lights in bedrooms, and additional unit-safe sitting areas in bedroom (e.g., bean bag chair).
Conclusion: Adapting CBT-I principles to specifically target sleep difficulties unique to psychiatric inpatients at all three levels (i.e., patient, staff, and environment) has the potential to support sleep in this vulnerable population. Future research is needed to test efficacy of this comprehensive approach.
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1056

MEDICAL RECORD ALERT TO INCREASE PAP USE IN HOSPITALIZED PATIENTS ON HOME PAP FOR SLEEP DISORDERED BREATHING

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Introduction: Many patients with sleep disordered breathing (SDB) on home positive airway pressure (PAP) therapy are not ordered for PAP treatment when hospitalized. Our quality improvement project evaluated whether establishing an electronic medical (EMR) alert to place PAP orders on patients with home PAP for SDB, could be successfully implemented and lead to an increase in PAP ordering in hospitalized patients.
Methods: In April 2021 the nursing intake assessment was changed to ask if patients had SDB and used PAP at home. In September 2021, an EMR alert was implemented and triggered when a physician or advanced practice provider opened the chart of a patient on home PAP use if PAP therapy was not already ordered. We conducted a retrospective chart review to compare rates of PAP ordering for hospitalized patients with SDB on domiciliary PAP before (August 2021), during (9/7/2021-9/11/2021), and after (October 2021) implementation of an EMR alert. We included all patients admitted to medical and surgical wards of Baystate Medical Center. We excluded patients admitted to ICU and patients who had contraindications to PAP therapy including encephalopathy or vomiting.
Results: The alert was discontinued after 4 days due to hospitalist feedback that receiving the alert when the chart was first opened was disruptive to workflow. We were unable to link the alert to later steps in the workflow. Rates of PAP orders were 61.4% (148/241, 95% CI: 54.9, 67.6), 66.7% (28/42, 95% CI: 50.5, 80.4), and 65.6% (168/256, 95% CI 59.4, 71.4), respectively. Patients admitted to observation unit were prescribed PAP 46.7% (21/45), 71.4%(5/7) and 55.6% (25/45), respectively. Patients on surgical units were prescribed PAP 63.0% (29/46), 75% (6/8), 70.2% (40/57), respectively. Patients on medical units were prescribed PAP 65,3% (98/150), 63.0% (17/27), 66.9% (103/154), respectively.
Conclusion: An EMR alert for providers to prescribe in-hospital PAP therapy for patients on home PAP therapy may increase rates of PAP ordering, but implementation must be congruent with provider workflow. Although surgical and observation units had larger increases in PAP ordering with the alert, variability may due to small sample size so further evaluation is needed. Further studies are needed to optimize alert type and timing and assess utility.
Support (if any):

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1057

A TALE OF TWO LANGUAGES: EVALUATING CAREGIVER SATISFACTION WITH TELEMEDICINE IN A PEDIATRIC SLEEP MEDICINE CLINIC

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Introduction: The COVID-19 pandemic highlighted the ability need of telemedicine to provide comprehensive and quality care to patients remotely. Sleep medicine has been one of the subspecialties that has seamlessly integrated telehealth into its practice. However telehealth may hinder access to care and disproportionately impact vulnerable populations. owing to a growing body of research that supports its efficacy in diagnosing and managing sleep disorders. Although studies have established the similarity in quality of care between telemedicine and traditional in-person visits, there still exists a gap in our understanding of caregiver satisfaction, especially among Spanish-speaking caregivers. This study aims to assess the experiences of English and Spanish- speaking caregivers who received telemedicine services in our pediatric sleep clinic.
Methods: This was a cross-sectional anonymous one-time survey performed at the pediatric sleep clinic at University of California (UCSF) Benioff Children's Hospital Oakland. The survey included caregivers who spoke English or Spanish and whose child had a sleep medicine appointment over Zoom. Responses were collected using Research Electronic Data Capture (REDCap), and descriptive analyses were conducted.
Results: 34 participants completed this survey. 71% (n=24) were English speaking and 29% (n=10) were Spanish speaking. Among Spanish-speaking participants (n=10), 60% were satisfied compared to 92% (n=22) of English-speaking participants. The main reasons cited were decreased time missing school or work and decreased travel time. Of those who were Spanish speaking, 40% (n=4) were dissatisfied with telehealth in comparison to 8% (n=2) of English-speaking participants. The main reasons for dissatisfaction included connectivity issues and

preference for in-person appointments. Spanish-speaking participants experienced more difficulties with Zoom, such as receiving the wrong Zoom ID, not receiving instructions beforehand, and not knowing who to call for help.
Conclusion: Our study suggests that while the majority of families are satisfied with telemedicine and are interested in continuing with a hybrid model of in-person and telehealth visits in the future, Spanish-speaking families were less satisfied with telemedicine than English-speaking families. Having knowledgeable and supportive staff to troubleshoot problems with connectivity, access to interpreters, and offering at least one in-person appointment can improve satisfaction with telemedicine for Spanish-speaking patients.
Support (if any):

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1058
EXPERIENCE OF VA TELESLEEP MEDICINE FOLLOWING THE COVID PANDEMIC

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Introduction: The VA Telesleep Enterprise Wide Initiative (EWI) operated from 2017 through 2023 and focused on increasing sleep medicine care to rural Veterans. Part of the Telesleep EWI was promotion of telehealth visits to improve access to sleep medicine care for rural Veterans. This report examines the significant growth of telesleep visits during the COVID-19 pandemic and the strong sustainment in Telesleep care in EWI sites post-pandemic. EWI sites participated in weekly clinical support meetings and best practices sharing to foster uptake and improvement of telesleep clinical work. Non EWI sites did not have access this support network.
Methods: Data regarding clinical visits for sleep medicine at a national level were obtained from the VA Corporate Data Warehouse by trained and experienced data analysts. Data from 2019 through fiscal year 2023 were obtained which spans the pre-pandemic to the post-pandemic time frame. The data were analyzed by medical center based on whether the site was part of the Telesleep EWI or not part of the EWI. In this report only rural Veterans were analyzed.
Results: From 2019 to 2023, for rural Veterans, the proportion of total sleep medicine visits performed using telehealth modalities increased from 25% to 56% for sites in the Telesleep EWI compared to 16% to 36% in the non EWI sites. Comparing Telesleep visits at the peak of pandemic in 2021-22 to post-pandemic 2023, Telesleep visits peaked at 61% and decreased to 56% in 2023 for the EWI sites and peaked at 52% and decreased to 36% in non EWI sites.
Conclusion: The COVID -19 pandemic resulted in rapid changes in healthcare delivery for many clinical services including sleep medicine. Post-COVID-19 many clinicians returned to previous care delivery models. In VA, where telesleep medicine virtual care was strongly supported in the EWI, sites showed greater sustainment of virtual care compared to non EWI sites. We speculate that ongoing support of clinicians through training and expert support in the EWI accounted for this better sustainment of virtual care.
Support (if any): VA Office of Rural Health; VA Office of Connected Care; VA HSR&D Merit Review

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1059
EFFECTS OF COVID-19 ON SLEEP SERVICES USE AND ITS RECOVERY

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Introduction: The COVID-19 pandemic affected the utilization of various healthcare services differentially. Sleep testing services utilization (STU) (Home Sleep Apnea Testing [HSAT] and Polysomnography [PSG]) were uniquely affected. We assessed the effects of the pandemic on STU and its recovery using the Veterans Health Administration (VHA) data.
Methods: A retrospective cohort study from the VHA between 01/2019 and 10/2023 of veterans with age ≥ 50. We extracted STU data using Current Procedural Terminology codes for five periods based on STU and vaccination status: pre-pandemic (Pre-Pan), pandemic sleep test moratorium (Pan-Mor), and pandemic pre-vaccination (Pan-Pre-Vax), vaccination (Pan-Vax), and postvaccination (Pan-Post-Vax). We compared STU between intervals (Pre-Pan as the reference).
Results: Among 261,371 veterans (63.7±9.6 years, BMI 31.9±6.0 kg/m², 80% male), PSG utilization decreased significantly during Pan-Mor (-56%), Pan-Pre-Vax (-61%), Pan-Vax (-42%), and Pan-Post-Vax (-36%) periods all compared to Pre-Pan. HSAT utilization decreased significantly during the Pan-Mor (-59%) and Pan-Pre-Vax (-9%) phases compared to the Pre-Pan and subsequently increased during Pan-Vax (+6%) and Pan-Post-Vax (-1%) periods. Over 70% of STU transitioned to HSAT, and its usage surged five months after the vaccine introduction.
Conclusion: Sleep testing services utilization recovered differentially during the pandemic (PSG vs HSAT), including a surge in HSAT utilization post-vaccination.
Support (if any): Supported by National Institutes of Health, National Heart, Lung, and Blood Institute (NHLBI) K25 funding (1K25HL152006-01 [J.R.]); ZOLL Respicardia (31002 [A.S.]); Airborne Hazards and Burn Pits Center of Excellence (AHBPCE, Award #: FY2024-002 [J.R.]); and the use of facilities and resources at the Center for Innovations in Quality, Effectiveness, and Safety (CIN 13-413), Michael E. DeBakey VA Medical Center, Houston, TX. The opinions expressed are those of the authors and not necessarily those of the Department of Veterans Affairs, the U.S. government, or Baylor College of Medicine.

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1060
IMPLEMENTATION OF A TWO-WAY AUTOMATED TEXT MESSAGING PROGRAM FOR COMMON PAP-RELATED PROBLEMS

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Introduction: Without consistent PAP data monitoring, clinics struggle to identify issues with patients' PAP receipt and usage.

To address this, we created PennPALS (Penn PAP Automated Learning System), a cloud-based platform that filters PAP data extracted from the electronic medical record (EMR) through algorithms to identify common PAP issues, such as non-adherence, mask leaks, elevated residual AHI, or delayed setups. Patients are contacted about issues through two-way text messaging.
Methods: PennPALS auto-enrolls patients based on an EMR PAP order. Patients can opt out at any time during the 90-day monitoring program. We conducted a retrospective evaluation of PennPALS for patients enrolled June 2023.
Results: In one month, 279 patients were enrolled (mean age 54.9 (14.5) years, 56.3% male, 48.8% white, 40.5% Black or African American and 6% Hispanic). One hundred eighty-nine patients entered a 90-day data monitoring window (mean age 54.1 (14) years, 57.7% males, 45.5% white, 41.8% Black or African American, 3.8% Hispanic, and 58.7% new to PAP). Ninety patients never had PAP data in EMR. Two patients were ineligible due to invalid phone number in EMR and 25 opted out (4 at enrollment; 21 during monitoring). During the 90 day monitoring, the following number of triggers were activated: 247 non-adherence (7 day avg. < 4hrs), 571 adherence (7 day avg. >4hrs), 314 mask leak (Phillips: avg % time in large leak ≥ 30% for ≥3 of 7 days; ResMed: leak ≥ 24 L/min for ≥3 of 7 days), 8 high residual AHI (7 day avg ≥ 10 events/hr), 62 no data triggers (no data for 5 days), and 9 continued no data triggers. Of patients that completed the exit survey (n=20), average "how helpful" score (scale 0-10) was 7.9 (3.9) and Net Promotor Score (e.g., likelihood to recommend) was 87.
Conclusion: PennPALS demonstrates real-word feasibility to monitor patients and identify issues with algorithms based on discrete PAP data within EMR. Identified issues triggered two-way text messaging to improve PAP communications. The high number of patients without PAP data requires further investigation (e.g., patient did not pursue PAP, modem not linked). Patients reported that PennPALS was helpful and they would recommend it.
Support (if any): K12HS026372

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1061
IMPROVING ACCESS TO PEDIATRIC SLEEP SERVICE BY UTILIZING UNIQUE ELECTRONIC MEDICAL RECORD BASED INFORMATIC TOOLS

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Introduction: Fragmented scheduling processes, workforce shortage and limited resources affected patient care and hindered access to pediatric sleep services. Between 40-60% pediatric sleep consult orders remained unscheduled at the Cleveland Clinic's Sleep Disorder Center every month in 2019 and 2020. We aimed to reduce unscheduled pediatric sleep consult orders and improve access by utilizing unique automated electronic medical record (EMR) based informatics tools.
Methods: Several key steps were implemented via a systematic A3 project charter utilizing continuous improvement methods. Unique informatics tools including ticket schedule via my chart patient portal, automated calling and messaging system for scheduling prompts, simplified scheduling templates and efficient electronic monitoring system was developed and implemented via Epic Hyperspace EMR system between 2020-2022.
Results: Key outcomes accomplished: 1. Visual scheduling report system/dashboard 2. Electronic workflow for schedulers 3. Automated patient driven ticket scheduling via patient record portal and embedded EMR questionnaire. 4. By December, 2022, 88% of consult orders were scheduled at a scheduling rate of >80% every month 5. By October 2023, 93% of order were scheduled per month 6. Up to 52% of all patients scheduled visits via automated scheduling system 7. Several patients/families subjectively reported positive experience and high satisfaction utilizing automated system or traditional scheduling 8. Significant amount of time spent on scheduling for patient and health care team was saved.
Conclusion: Despite several challenges during COVID pandemic including loss of personnel, limited resources, frustrating processes, and constant changes in the course this continuous improvement project achieved very high level of scheduling in unique and innovative manner and helped significantly improve access to much needed pediatric sleep care. Such tools can be replicated within and at other health care organizations with exponential impact on access to pediatric sleep services.
Support (if any): None

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1062
VR FOR STRESS REDUCTION AND SLEEP HEALTH IMPROVEMENT AMONG PERINATAL WOMEN: INSIGHTS FROM THE NURTURING MOMS STUDY

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Introduction: This qualitative study explores the multifaceted experience of motherhood and its impact on mental wellness, sleep health, and resilience, as well as examines barriers and facilitators of virtual reality (VR) use for stress management among perinatal women of color.
Methods: Two focus groups were held with perinatal women [n = 13; average age 32 years] identifying as Black or Latina, enrolled in the ongoing Nurturing Moms study at the University of Miami Miller School of Medicine. This pilot project evaluates NurtureVR, a VR-based program for pregnancy-related education and maternal wellness that integrates mindfulness techniques, relaxation, and VR-enabled guided imagery for the pregnancy and post-partum periods. An inductive and iterative approach was employed in the qualitative analysis of the focus group transcripts to identify key themes.
Results: The qualitative analysis identified five primary themes, encompassing 19 nuanced sub- themes and a total of 94 references: 1) Navigating Motherhood, 2) Maternal Mental Wellness, 3) Embodied Therapy, 4) Postpartum, and 5) Resilience. These themes cover a range of topics including the complexities of motherhood in women from the global majority, maternal mental health, attitudes towards VR for therapy, discussions on postpartum care and medication, and diverse views on resilience as an essential trait among mothers. Participants shared a variety of challenging experiences related to household management, caregiving, financial stress, breastfeeding, finding relaxation time, and achieving adequate sleep. There was also a significant interest in learning about the connection between sleep and stress, with maternal sleep health being identified as a potential area for future VR-based interventions.

Conclusion: These findings highlight the numerous challenges and barriers faced by women of color during and after pregnancy, which can significantly impact their mental and sleep health. Holistic public health programs targeting maternal health should not only incorporate screening for mental health and sleep issues but also address social determinants of health comprehensively. Additionally, culturally responsive behavioral treatments, which consider the intersection of identities including VR interventions, demonstrate the potential in providing timely and tailored mental health support to perinatal women.
Support (if any): NIH 5R01HL142066

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1063

PREDICTORS OF INSUFFICIENT TREATMENT RESPONSE TO DIGITAL CBT-I: RESULTS FROM THE RESTING STUDY

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Introduction: Triaged stepped-care approaches start patients in either lower or higher intensity of treatment based on participant characteristics, switching patients who demonstrate insufficient progress in lower intensity treatment to higher intensity treatment. The purpose of the present study was to investigate characteristics of participants who were predicted to benefit from lower intensity treatment (digital CBT-I [dCBT-I]) and made insufficient progress following two-months of dCBTI, compared to similar participants who made sufficient progress.
Methods: Participants were 101 adults aged 50 or older who were triaged to begin treatment with dCBT-I as part of the RCT of the Effectiveness of Stepped-Care Sleep Therapy in General Practice (RESTING) study. Specifically, these participants had to have taken sleep medications < 4x/week, score below clinical cutoffs for moderate-severe mental health comorbidity and daytime sleepiness, and sleep >4.5hrs/night on average. T-tests were used to compare baseline characteristics of participants who made insufficient progress after two months of dCBT-I to those who made sufficient progress. Sufficient progress was defined as ISI ≤ 10 or reduction of at least 50% in sleep medication use.
Results: Those with insufficient progress in dCBT-I (N= 74) had higher insomnia severity index (ISI) scores at baseline than those with sufficient progress in dCBT-I (p=.002, d=.70). There were no significant differences in terms of baseline Dysfunctional Beliefs and Attitudes about Sleep (DBAS) scores (p=.39), chronotype (Morningness-Eveningness Questionnaire: MEQ; p=.32) or sleep medication use (p=.39); effect sizes for the differences were small (d=.19-.23). Further, there was no significant difference in the number of digital modules completed (p=.13, d= .35) between those who did and those who did not make sufficient progress.
Conclusion: Only greater insomnia severity at baseline was a significant predictor of insufficient treatment response among participants who were triaged to begin treatment with dCBT-I. Further research is needed to determine if insomnia severity alone or when combined with the RESTING study triage algorithm will improve the identification of those likely to benefit optimally from dCBT-I.
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1064

PERCEPTION OF CBTI TREATMENT MODALITIES IN OLDER ADULTS WITH INSOMNIA: COMPARING DIGITAL AND THERAPIST-LED DELIVERY

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Introduction: A shortage of trained providers limits access to cognitive behavioral therapy for insomnia (CBTI). Supplementing traditional in-person, therapist-led CBTI with telehealth delivery and fully automated digital CBTI (dCBTI) can improve accessibility. Characterizing perceived advantages and disadvantages of distinct delivery modalities among patients with insomnia can inform targeted resource allocation and clinical rollout of CBTI. Thus, the current study aims to describe patients' pre-treatment preferences for therapist-led (in-person and telehealth-delivered) and automated dCBTI, as well as patient-identified advantages and disadvantages of these modalities.
Methods: Participants (N = 80) 50 years and older (M age = 64.2, SD = 7.9; female = 85.2%) were randomly selected from the RESTING Study, an RCT evaluating a triaged stepped-care model for treating insomnia disorder (DSM-5), to undergo a semi-structured interview at baseline, prior to study treatment assignment and exposure. Interviews were recorded, transcribed, and coded by three raters (inter-rater reliability: 85.0–93.0%). Response themes were identified inductively via qualitative thematic analysis.
Results: Approximately two-thirds of participants (n = 50, 62.5%) preferred therapist-led CBTI, delivered in-person or via telehealth, over automated dCBTI. The most common participant-identified advantage of dCBTI (n = 55; 68.8%) and telehealth-delivered CBTI (n = 65; 81.3%) was convenience. The most commonly reported disadvantages of dCBTI were limited customizability (n = 39, 38.75%) and lack of human connection (n = 40, 50.0%). However, some participants (n = 13, 16.30%) viewed lack of human connection as an advantage, citing the nonjudgmental nature of online programs and reduced social anxiety/fatigue. The main disadvantage identified for telehealth-delivered CBTi was loss of nonverbal communication (n = 20, 25%).
Conclusion: While participants identified advantages and disadvantages of both dCBTI and therapist-led CBTI, findings suggest a general preference for therapist-led treatment among middle-aged and older adults. This study is one of the first to examine participant preferences for and perceptions of CBTI delivery modalities prior to receiving study treatment(s). Findings can guide referring providers' presentation of insomnia intervention options to patients and inform targeted discussions of perceived barriers to treatment. Moreover, results lay a foundation for future research examining the relationship between pre-treatment preferences/perceptions and longitudinal treatment adherence, engagement, and clinical outcomes.
Support (if any): 1R01AG057500

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1065

PRELIMINARY FINDINGS OF A PILOT CLINICIAN TRAINING PROGRAM TO INTEGRATE DIGITAL CBTI INTO ROUTINE THERAPY

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Introduction: Many patients who enter treatment for mental health problems experience insomnia symptoms that may hinder their response to general mental health treatment. There is also a shortage of CBTi providers in the United States and worldwide. One method to address the paucity of CBTi providers is to integrate digital CBTi (dCBTi) into general psychotherapy, which, on its own, does not sufficiently address insomnia symptoms. This approach is likely to improve sleep and potentially also mental health outcomes. Integrated dCBTi provides the patient with support around adherence and engagement. This study aims to pilot test and refine a program for training licensed therapists to support their patients undergoing dCBTi. This integrated approach is novel and yet to be tested.
Methods: Licensed therapists participate in a 4-hour training. Therapists subsequently enroll 1-2 patients with insomnia symptoms and comorbid depression and/or anxiety to receive integrated dCBTi. Therapists complete measures evaluating the training. At each psychotherapy session, therapists complete a checklist documenting which elements of the integrated dCBTi support they provide and how much time they spend doing so. Patients complete the Insomnia Severity Index, the Diagnostic Interview for Anxiety, Mood, and OCD and Related Neuropsychiatric Disorders, and qualitative measures about their experience of integrated dCBTi after receiving integrated dCBTi.
Results: As of December 2023, 11 therapists are enrolled and patient enrollment is ongoing. After the training, therapists rated that they were "well-prepared" to integrate dCBTi into their routine practice, and 100% indicated that they would recommend this training. Regarding the content of dCBTi, therapists expressed understanding of the value of time in bed restriction and importance of monitoring the patient's engagement and progress continuously. Therapists also noted an improved ability to present the rationale for CBTi components and to answer patient questions about dCBTi. Post training data, including patient data, will be available by June 2024.
Conclusion: The integration of dCBTi in general psychotherapy through brief training of licensed therapists may be a viable approach to improve access to CBTi for patients with comorbid depression and/or anxiety.
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1066

ACCEPTABILITY AND FEASIBILITY OF TRAINING TO INTEGRATE DIGITAL CBTI IN ROUTINE THERAPY: EVIDENCE FROM FOCUS GROUPS

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Introduction: Over 31% of patients who enter treatment for mental health problems experience insomnia symptoms, which can be effectively treated using cognitive behavior therapy for insomnia (CBTi). However, routine psychotherapy for mental health problems does not adequately address insomnia symptoms. Integrating CBTi into routine psychotherapy in a feasible and acceptable manner could both extend the reach of CBTi and enhance mental health outcomes. Digital CBTi (dCBTi) is a promising and scalable option for integration. Supported dCBTi programs have better engagement, adherence, and clinical outcomes compared to unsupported programs. Hence, integrating dCBTi into routine psychotherapy, whereby the therapist introduces and provides support for dCBTi among patients receiving general psychotherapy for other mental health problems, may improve adherence and engagement. This study aims to determine the initial feasibility and acceptability of integrated dCBTi to providers.
Methods: Six virtual focus groups were conducted with licensed therapists with a range of graduate training. Each focus groups included 6-11 participants and lasted one hour. Inductive thematic analysis was used to extract themes. Therapists also completed a zoom poll at the end of the focus group.
Results: The sample included 52 licensed therapists (81% female, 81% White). Therapists had a range of graduate training (21 PhD/PsyD, 11 LCSW, 10 MFT, 9 LPC, and 2 MD). 83% of therapists indicated that they want training in integrated dCBTi. Two participants (5%) had some previous training in CBTi; they were the only individuals who indicated no interest in receiving the training. Six participants (12%) were unclear. Two training focused themes arose: desire for receiving CEs and a need for advanced notice to reserve the time required for a workshop. 88% reported seeing the potential value of integrated dCBTi (unclear=12%). Two themes arose regarding content of training: the need to know the contents of dCBTi and the value of consultation. As a feasibility theme, therapist highlighted that they could find 5-10 minutes of session time to provide the support for dCBTi.
Conclusion: Preliminary analyses indicate that integrated dCBTi is a feasible approach. Therapists are willing to be trained and see its potential value.
Support (if any): AASM Foundation 300-BS-23

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1067

INCREASING ACCESS TO BEHAVIORAL INSOMNIA CARE: A HYBRID IMPLEMENTATION-EFFECTIVENESS TRIAL

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Introduction: Chronic insomnia is common among Veterans and contributes to poor health and quality of life. To improve access to care, Brief Behavioral Treatment for Insomnia (BBTI) was developed for delivery outside of specialty care settings. BBTI is a brief, flexible, and effective adaptation of CBT-I. However, training alone is rarely sufficient for sustainable change and implementation strategies are needed for successful uptake and adoption.

Methods: This was a stepped wedge, hybrid 3 implementation-effectiveness trial at 4 VA Medical Centers. Primary Care Mental Health Integration (PCMHI) providers attended a 3-hour live online BBTI training followed by a pre-implementation phase prior to receiving implementation support. During the 12-month implementation phase, strategies and support were provided by the hub-site and assisted by each site's implementation champion. After 12-months, support was withdrawn. Data from the VA Corporate Data Warehouse were extracted across four phases (pre-training, pre-implementation, implementation, post-implementation) and compared within and between sites. The reach, effectiveness, adoption, implementation, and maintenance (RE-AIM) framework informed outcomes; reach data is presented here from pre-training to pre-implementation and pre-implementation to implementation. Analyses were conducted using logistic regression with a fixed effect for study phase.
Results: Sites 2, 3, and 4 saw significant increases in the proportion of Veterans engaging in BBTI from post-training to pre-implementation (8.37% - 24.16%; ps< 0.00001); site 1 did not have a pre-implementation phase. From pre-implementation to implementation, sites 1 and 3 saw significant increases in Veterans engaged in BBTI (7.32% - 22.3%; ps< 0.0001), site 2 had a non-significant increase in BBTI (4.14%; p=0.21), and site 4 had a non-significant decrease in BBTI (-0.89%; p=0.82). All four sites also saw significant reductions in sleep medications prescribed in Primary Care (-0.60% - -1.43%; ps< 0.0001) from pre-implementation to implementation.
Conclusion: BBTI training alone plus implementation support resulted in mixed findings across the four sites. However, BBTI in PCMHI increased over time across the study phases. BBTI plus implementation support also contributed to sleep medication reductions in Primary Care. Contextual barriers and facilitators also need to be evaluated to determine their impact on efforts to implement BBTI in VA PCMHI clinics.
Support (if any): VA HSR&D I01HX003096

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1068

SLEEP EDUCATION AND AWARENESS AMONG SOCIAL WORKERS: A NATIONWIDE STUDY

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Introduction: Social workers are frontline behavioral health clinicians and comprise the majority of the mental health workforce. As poor mental health often co-occurs with inadequate sleep and sleep disorders, social workers can play a pivotal role in promoting sleep health among their patients as well as provide referral and treatment options if a sleep disorder is suspected. However, the Council on Social Work Education (CSWE) does not mandate sleep education in the social work curricula. There is little knowledge about how much training social workers have received about sleep. This study aims to investigate the state of sleep health education and sleep health awareness among social workers.
Methods: Recruitment emails were sent to licensed social workers across the US, through national social work organizations and faculty listservs. Eligibility criteria included being a licensed social worker in the US and ability to read and write in English. Respondents were queried about the extent of their sleep health training and clinical practice in this domain using QuestionPro software.
Results: A total of 363 social workers, predominantly female (72.4%) and non-Hispanic white (76.2%) participated. Most (62.0%) reported not receiving any sleep education during their formal social work training. Among those reporting sleep education during their graduate studies, the average duration was 3.3 hours (SD=2.8). Many social workers (67.9%) reported receiving formal sleep education post-licensure (mean=7.0 hours; SD=6.5). Few participants (2.8%) reported confidence in recognizing insomnia disorder, and only half (50.2%) were aware that CBT-I is an evidence-based treatment for insomnia. Despite this, a majority (80.0%) reported discussing sleep with their patients during treatment. Most social workers (84.0%) reported interest in learning more about sleep health.
Conclusion: The majority of social workers did not receive sleep education during their formal graduate studies, with many seeking to address this deficit following professional licensure. Only a small fraction of social workers report confidence in recognizing sleep disorders, which can impact proper referral and treatment of sleep disorders. Considering the relationship between sleep and mental health, promoting sleep health education and awareness in educational programs for behavioral health clinicians can have important implications for overall health promotion.
Support (if any):

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1069

THE EFFECTS OF FORMAL SLEEP MEDICINE DIDACTICS ON FAMILY MEDICINE RESIDENTS' CONFIDENCE WITH SLEEP DISORDERS

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Introduction: Exposure to sleep medicine education in ACGME accredited parent specialties of sleep medicine is scarce and varied. Literature states sleep-related didactics average 4.75 hours per year; less than 10% of programs have graduates pursuing sleep medicine fellowship. In the last five years at University of Kentucky's Family and Community Medicine residency (UK FM), only 4 of 1200 hours of didactics (less than 1%) have been dedicated to sleep. Lack of sleep education during residency leads to patient care gaps, and deficiency of exposure to this field dissuades trainees from pursuing sleep fellowship. To understand UK FM residents' opinions of sleep medicine, a survey was distributed before and after a formal lecture series.
Methods: Google surveys were disseminated via text message to residents. Submissions remained anonymous. The pre- and post-lecture surveys had congruent questions about sleep education, sleep disorder management, and tested knowledge about sleep disorders. The lecture series had three one-hour lectures during didactics. One week after the last lecture, the post-survey was disseminated. Results were then compared.
Results: The current cohort is comprised of 17 residents. Response rate was 94% for the pre-survey and 76% for the post-survey. After lectures, 46% agreed they had adequate education and understanding of sleep medicine compared to 0% before. Regarding managing specific disorders, more residents answered they had higher comfort after the lectures. Majority of the residents (>50%) answered 2/3 knowledge questions correctly after the lecture series. Overall trends indicated increased confidence and knowledge after the lectures.

Conclusion: By simply increasing sleep education didactics by 3 hours through this project, the total percentage of sleep didactics in resident education was tripled. This increased confidence and competency of residents in sleep education. Our study highlights the current gaps in resident education related to sleep, the need to increase sleep didactics in sleep medicine feeder residencies, and ultimately how this education increases resident confidence and competency in sleep management.
Support (if any):

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1070
AWAKENING INSIGHTS: INCREASING SLEEP MEDICINE EDUCATION FOR PSYCHIATRY RESIDENTS

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Introduction: Sleep is integral to mental health. For example, it is estimated that 40 to 50% of individuals with insomnia have co-occurring mental illness. Despite this, only ~3.31% of current sleep medicine fellows enter from a psychiatry residency, ~4.89% of sleep medicine fellowship alumni are psychiatrists, and 4.25% of sleep faculty members have a psychiatry background. At the present time, the Accreditation Council of Graduate Medical Education has no curriculum requirement for sleep education within psychiatry residency programs. A past study has shown that less than 40% of psychiatry programs have faculty with training in sleep medicine. If sleep medicine is not prioritized amongst psychiatry residents, psychiatry is at risk of losing representation in the field.
Methods: From November to December 2023, a voluntary & anonymous online 15-minute, 32 question survey was given to psychiatry residents in the third largest psychiatry residency program in the country. The survey evaluated psychiatry residents' knowledge on guidelines from the American Academy of Sleep Medicine, as well as attitudes, behaviors, and barriers towards sleep medicine.
Results: A total of 31 psychiatry residents completed the survey. Results show perceived and objective opportunities to improve sleep education amongst psychiatry residents. Residents demonstrated discomfort in counseling patients regarding topics including sleep related breathing disorders (43%), non-REM parasomnias (53%), and REM behavior disorders (45%). Barriers were identified regarding discussing sleep with patients included limited training (43%), lack of time (37%), and decreased prioritization (17%).
Conclusion: More can be done to promote sleep medication education for psychiatry residents. While analysis is ongoing, it is the hope that the results of this survey will lead to the development of applicable curricula with expected completion within 12 months. We anticipate identifying specific educational needs to inform the development of a standardized sleep medicine training protocol for residents in hopes of increasing the number of psychiatry residents willing to consider sleep medicine as a possible future career. With research establishing a bidirectional relationship between sleep and psychiatric disorders, it is imperative that curricular improvements are targeted, so that psychiatrists can continue to contribute to the field of sleep medicine.
Support (if any): UT Health San Antonio Department of Psychiatry

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1071
KNOWLEDGE AND ATTITUDES REGARDING OBSTRUCTIVE SLEEP APNEA AMONG PULMONOLOGISTS IN SOUTH KOREA: A SURVEY STUDY

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Introduction: Obstructive sleep apnea (OSA) has known associations with cardiovascular and metabolic conditions and is increasingly recognized in chronic lung diseases like COPD and IPF. In South Korea, OSA patients receive care from various specialties, but pulmonologists' involvement is limited. This study aimed to assess the knowledge and attitudes of pulmonologists in South Korea regarding OSA.
Methods: An online survey was conducted in February 2023, targeting all registered respiratory specialists listed in the online directory of the Korean Academy of Tuberculosis and Respiratory Diseases. The survey utilized the "Obstructive Sleep Apnea Knowledge and Attitudes Questionnaire" (OSAKA), a previously validated instrument. Three email invitations were sent to potential participants to encourage survey participation.
Results: A total of 127 pulmonologists (20.0%) completed and returned the questionnaires. The mean age of respondents was 45.4 ± 8.6 years, with 68.5% being male. Additionally, 71.7% of respondents were affiliated with university hospitals, and 79.5% were working in hospitals with more than 500 beds. The median total knowledge score was 15.0 [13.0;16.0], and the overall proportion of correct answers was 0.8 [0.7;0.9]. Notably, pulmonologists who had experience in managing OSA patients exhibited significantly higher knowledge and attitude scores than their counterparts without such experience. Furthermore, those with OSA treatment experience demonstrated more confidence in OSA screening, OSA diagnosis, and continuous positive airway pressure (CPAP) therapy management. Interestingly, attitude scores tended to be higher among older respondents and those who graduated from medical school and completed pulmonology specialist training earlier in their careers.
Conclusion: The knowledge levels of South Korean pulmonologists regarding OSA were found to be comparable to or better than those reported in previous studies. Nevertheless, there remains a need for targeted education and practical exposure to OSA management, especially for younger respiratory physicians, to enhance their proficiency in treating OSA patients effectively.
Support (if any):

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1072
PULMONARY FELLOWS NEED MORE SLEEP: A SLEEP DISORDERED BREATHING CURRICULUM FOR PULMONARY FELLOWS

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Introduction: Sleep medicine training in pulmonary and critical care (PCCM) fellowships varies widely. The lack of formal curriculum and local pilot data demonstrating limited mastery of sleep medicine concepts via typical clinical exposure prompted us to develop, implement, and evaluate a sleep disordered breathing curriculum for first year PCCM fellows.
Methods: This educational study utilizes a historical control pre-test post-test model. The intervention arm consists of first-year PCCM fellows (n = 7) who completed a 10-question evaluation prior to fellowship-level education. They participated in a novel curriculum and are completing the same test upon conclusion of the curriculum. The curriculum is based on five case vignettes covering obstructive sleep apnea, obesity hypoventilation and sleep disordered breathing in COPD, heart failure, and neuromuscular disease. The control arm is comprised of PCCM fellows (n = 6) who have not had exposure to the SDB curriculum. They completed the evaluation at the conclusion of first year and at the beginning of their third year of fellowship. The evaluation was developed by local and national pulmonary and sleep medicine educators with expertise in question-writing.
Results: Test scores amongst the control group remained low at the end of first year of fellowship, with a mean score of 6/10 (60% +/- 8.9) and have remained low at the beginning of their third year of fellowship with a mean score of 5/10 (50% +/- 11.5%). When asked using a 5 point Likert scale (1=totally uncomfortable, 5=totally comfortable), to assess their comfort with the diagnosis and management of obstructive sleep apnea, the overall average response of 3.08 +/- 0.63 suggests limited comfort with these concepts. In regards to the intervention group, the mean pre-test score prior to beginning the curriculum was 3.71/10, (37.1% +/- 26.3%). Post-curriculum testing and data collection is ongoing with the intervention group, but preliminarily suggests an improvement in comfort level.
Conclusion: We suspect that the intervention group will demonstrate improved knowledge and comfort in the management of SDB. These results would suggest that our curriculum offers an opportunity to increase the number of pulmonologists who are able to care for the growing population of patients with SDB.
Support (if any):

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1073

FEASIBILITY OF USING WEARABLES TO TRACK SURGEON SLEEP: RESULTS FROM A PILOT STUDY

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Introduction: It is well known that the sleep among surgeons is often of short duration and poor quality. Surgeons regularly wake up before dawn, and nighttime call can pull them out of bed at any time in the night. While limitations to resident and faculty surgeon work hours have been added in the past decades, it is unclear if surgeon sleep habits have subsequently improved. Furthermore, few studies have used objective trackers to monitor surgeon sleep.
Methods: Ten surgeons were recruited from a large midwestern academic center's Department of Orthopedics to take part in the "Surgeons as Athletes" project. For this pilot study, surgeons were outfitted with various biometric sensors to measure their physiology before, during, and after operating. To monitor sleep-wake patterns, each surgeon was asked to continuously wear—except while operating—a commercially available sleep tracker (Oura ring) for a 14-day period. Descriptive statistics were used to understand compliance.
Results: The cohort consisted of seven residents and three faculty surgeons, four of whom identified as female and six as male. Out of 140 total nights, trackers were worn 66% of the nights (93 nights), with a median number of 9.5 nights recorded per participant. Only 30% of participants wore their tracker every night, while another 30% tracked their sleep for less than half of the nights. One participant did not wear their monitor at all during the study, despite follow-up from the researchers. Although not benchmarked against polysomnograms, 8 of the 93 wake up times (8.6%) were likely incorrect, suggesting either extremely early wake times when participants were not on call or extremely late wake times when participants were known to be operating.
Conclusion: This pilot study suggests that sleep tracking compliance among surgeons is poor, even when monitored passively by a wearable device. This could be due to the form factor of the device—a ring that must be removed while operating—requiring surgeons to remember to put it back on at the end of each day. Since surgeons are incredibly busy, an engaged study team and reminders each day has the potential to improve compliance.
Support (if any):

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1074

THE RELATIONSHIP BETWEEN BLOOD GLUCOSE AND SLEEP CONSISTENCY IN SURGEONS: RESULTS FROM A PILOT STUDY

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Introduction: Both sleep and blood glucose are vital, interconnected health metrics. These parameters are yet to be explored in surgeons, who often suffer from poor sleep hygiene and thus risk poor glucose handling. This study examines the interplay between surgeons' sleep consistency and fasting blood glucose levels on both operative and non-operative days.
Methods: Ten surgeons were recruited from a large midwestern academic center's Department of Orthopedics. Surgeons were given commercially available Oura rings to track sleep and continuous glucose monitors to measure minute-by-minute blood glucose levels over a 14-day period. Fasting glucose levels were calculated by taking the average glucose levels over the 75-to-15-minute period before waketime. Unpaired T-tests were used to analyze the data, and statistical significance was considered for p-values < 0.05.
Results: Seven residents and three faculty surgeons were a part of this pilot study's cohort, four of whom were female and six were male. Of the 140 total nights in the study, 88 (62.9%) had both glucose and sleep data fully recorded. In 22 of these, fasting glucose levels exceeded 100 mg/dL, six of which were operating days. When surgeons went to bed more than an hour earlier or later than usual before operating, their fasting glucose levels the next morning increased to 95.9 mg/dL compared to 85.7 mg/dL when they went to bed closer to their regular bedtime before operating (p = 0.128). Additionally, there was a statistically

significant difference (p=0.012) in fasting glucose levels in days surgeons woke up more than an hour earlier or later from their average waketime, resulting in an increase from 84.0 to 98.8 mg/dL in these days, although whether they were operating was not significant.
Conclusion: The strong association between poor wake time regularity and elevated fasting glucose adds to the current body of work demonstrating the importance of sleep regularity—in particular wake time regularity—on overall health. Impaired glucose handling due to poor sleep habits in this population can have consequences ranging from daily fatigue to increased intra-operative mistakes. In future studies, intra-operative glucose levels could be correlated with sleep metrics to better correlate glucose handling in this novel population.
Support (if any):

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1075
THE IMPACT OF OPERATING ON THE SLEEP CONSISTENCY OF SURGEONS: RESULTS FROM A PILOT STUDY

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Introduction: It is well known that sleep is essential for health, but not as much attention is given towards aspects of sleep like sleep timing or regularity, both of which are important characteristics of sleep quality. In medicine, surgeries may not always be planned. As a result, many surgeons suffer from poor sleep consistency. This study explores surgeons' sleep habits and compares sleep regularity on operating days to non-operating days.
Methods: Ten surgeons were recruited from a large midwestern academic center's Department of Orthopedics. Each surgeon was given an Oura ring for a 14-day period to track their sleep. After the 14-day study period, overall average bedtimes and wake times, and bedtime and wake time regularity were compared for operating and non-operating days. Regularity was calculated by taking the absolute change in bedtime or wake time compared to the previous day. Paired T-tests were used to analyze the data; statistical significance was considered for p-values ≤0.05.
Results: Of the 10 surgeons recruited, 7 were residents and 3 were faculty; 4 were female, and 6 were male. Through the 14-day period, a total of 95 (67.9%) of the possible 140 nights were recorded, 41 (43.2%) of which were OR days, and 54 (56.8%) were non-operating days. Average bedtimes (p = 0.185) and regularity (p =0.731) between operating and non-operating days showed no statistically significant difference. However, both average wake-up time (p = 0.024) and regularity (p = 0.006) illustrated statistically significant changes. Furthermore, when comparing the number of days wake-up times changed by more than 1 hour on OR days to non-OR days, a significant difference was appreciated (p = 0.016), while that of bedtime regularity remained insignificant (p = 0.082).
Conclusion: The significant changes in wake-up times support the idea that many surgeons have poor sleep regularity. While doctors and research stress the importance of maintaining a robust sleeping schedule to their patients, the structure of our healthcare system complicates surgeon's ability to maintain regular sleep themselves. Future studies should explore how poor sleep consistency impacts the physiological processes of surgeons and other healthcare workers.
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1076
FEASIBILITY OF SLEEP STAGING EEG ACQUIRED BY A DRY-ELECTRODE WEARABLE DEVICE USING A PSG-TRAINED ALGORITHM

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Introduction: Sleep monitoring hardware that allows for accurate sleep staging while also being unobtrusive and self-administered has the potential to make reliable EEG-based assessment of sleep quality at home widely accessible. However, for novel hardware utilizing dry EEG electrodes, a question remains regarding the similarity of these signals to traditional polysomnography (PSG), especially when used for therapy development. Here, we investigate how well EEG signals from a wearable dry electrode system can be sleep staged by an algorithm trained on traditional PSG.
Methods: The Dreem 3 headband, a low-profile sleep monitoring device with dry electrode EEG sensors, was used simultaneously with overnight PSG in 75 individuals. A machine learning model that was trained to stage sleep from the EEG signals of PSG, SleepStageML™, was run without modification on both the PSG and headband EEG signals. Each PSG recording was independently staged by 3 registered polysomnographic technologists to generate consensus ground-truth sleep stage labels. We compared the algorithmic performance of the sleep stages generated from the PSG signals to that of the sleep stages generated from the synchronously recorded headband data.
Results: Staging of PSG signals resulted in per-stage positive-percent-agreements (PPAs) of 92.4% for W, 58.4% for N1, 90.7% for N2, 76.0% for N3, and 92.9% for R. Negative-percent-agreements (NPAs) for these stages were 98.6%, 98.1%, 88.4%, 97.5%, and 98.4% respectively. When staging the headband recordings, performance remained high with PPAs for W, N1, N2, N3, and R of 94.4%, 34.7%, 88.2%, 78.6%, and 83.7% and NPAs of 96.2%, 98.9%, 86.5%, 96.3%, and 98.4% respectively. Cohen's Kappa on PSG signals was 0.82, and 0.77 on headband data.
Conclusion: We demonstrate that the EEG signals from a dry-electrode sleep monitoring system are similar enough to the EEG signals of a traditional PSG that an algorithm trained to stage PSG can also stage these dry-electrode signals. These results suggest that dry electrodes configured in a comfortable headband montage can capture clinical grade EEG useful for sleep staging with existing paradigms. These findings are promising for the broader investigation of cerebral functioning in sleep pathology, and could simplify the development of sleep biomarkers of neuropsychiatric disease.
Support (if any):

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1077

HOME TRANSCUTANEOUS CARBON DIOXIDE TRACKING FOR OPTIMIZING CARE OF CHRONIC RESPIRATORY FAILURE

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Introduction: Hypoventilation is a key component of respiratory failure, yet both in the clinical sleep laboratory and in the home ventilation care pathway, oximetry is often only measured. Thus, the degree of hypercapnia remains undocumented. Optimal home ventilation should reasonably target both oxygenation and ventilation. The Sleep Respiratory Failure program at the Beth Israel Deaconess, Boston, is a dedicated service managing nocturnal respiratory failure. In collaboration with a home care company, home ventilation tracking program was established.
Methods: Home testing/tracking of transcutaneous carbon dioxide (TcCO2) using the Sentec device was performed by Regional Home Care, a local DME company during 2021-2023. A respiratory therapist went to the patient's home and set up the device (pulse oximetry and TcCO2). A report was then sent to the ordering sleep medicine practitioner. TcCO2 tracking was not routine, and ordered only when there was concern for inadequate therapy.
Results: We included 45 TcCO2 testing (with 34 complete data) from 37 subjects, mean age 61.2 years old (31-84, SD 15.1), mean BMI 33.9 (16.8-58.5, SD 10), female 60% vs male 40% (mean age 63.6 and 57.7, respectively). COPD, OHS and CHF were the key diseases in 8, 5 and 10 subjects and out of those, 9 subjects had 2 combined diseases. 51.5% of subjects were on a ventilator, 30.3% on CPAP, 6% on BiPAP. 9.1% on O2 NC and 3% on room air with 30.3% on both PAP therapy and O2. Overall, average minimal saturation was 77.9% (51-92, SD 11.5) and average % of time with TcCO2 above 50 mmHg (Tover50P) was 30% (0-100, SD 38.2). Male and female subjects demonstrated Tover50P of 41.7% (95% CI 14.2-61.9) and 23.6 (95% CI 8.4-38.9), respectively.
Conclusion: Home TcCO2 is feasible and informative regarding the state of ventilation in patients with chronic respiratory failure. While oximetry is useful, knowing the actual TcCO2 allows critical decision making, including adjustment of ventilator settings or planning a sleep laboratory titration. It was revealing that residual hypoxia and hypercapnia were very common in this high risk group, despite substantial management effort including a dedicated respiratory failure clinic.
Support (if any): Institute for Personalized Sleep Health, Beth Israel Deaconess, Boston

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1078

PERFORMANCE OF USLEEP ALGORITHM TO A BETTER THAN "GOLD-STANDARD" POLYSOMNOGRAM VALIDATION DATA SET

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Introduction: Algorithm based PSG scoring is increasingly used in clinical practice and research. Currently, there is no accepted PSG validation data set to ensure algorithms are developed from an accepted standard; thus algorithm-based scoring has inherent inaccuracies. The purpose of this study was to evaluate the inter-rater agreement between three experienced sleep technicians to develop a PSG validation data set with a high interscorer reliability and compare performance of the USleep algorithm to the PSG validation data set.
Methods: One-hundred de-identified PSGs from a clinical database with 55 males and 45 females were independently scored by three different technicians and each record was quality controlled by a lead technician. The data set encompassed all sleep-related events: sleep stages, apneas, hypopneas, desaturations, arousals, and PLMs. Consensus annotations were computed when at least two technicians agreed upon a given event. The performance of each technician was compared against the consensus annotations. USleep was evaluated on the validation data set and the performance with respect to sleep stages was compared against the consensus annotations.
Results: The inter-rater agreement was 96.0% for sleep stages across all epochs, which did not greatly differ between N1 (88.3%), N2 (97.3%), N3 (94.2%) and REM sleep (98.1%). The inter-rater agreement across all records was 88.9% for arousals, 84.0% for obstructive apneas, 80.2% for central apneas, 76.4% for mixed apneas, 89.4% for hypopneas, 94.9% for desaturations, and 81.3% for PLMs. Comparing USleep to the consensus yielded an accuracy of 78.3%, with differences between N1 (46.2%) and N2 (76.8%), but not N3 (99.3%) and REM sleep (92.1%).
Conclusion: This data set has high accuracy for sleep stages. The USleep algorithm showed poor performance for N1 and moderate for N2, but high for N3 and REM. Frequently scored PSG measures to include arousals, hypopneas and obstructive apneas had high degrees of accuracy; however, this decreased for central and mixed apneas. This dataset can serve as a benchmark for developing and validating algorithms in PSG scoring for sleep stages and certain PSG measures. Further development is required to provide basis for a comprehensive PSG validation data set.
Support (if any):

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1079

ROBUST AUTOMATED SLEEP STAGING USING ONLY EEG SIGNALS

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[1] Beacon Biosignals

Introduction: Automated algorithms for assisting sleep technologists and clinicians in the staging of sleep have the potential to significantly speed the scoring of PSGs, reduce inter-rater variability, and improve the reliability of diagnosis of sleep disorders. Here, we describe an automated sleep staging machine learning algorithm that scores PSG using only EEG signals.
Methods: We describe a convolutional neural network-based sleep staging algorithm, SleepStageML™, that was trained on a database of >19,000 polysomnography recordings from a heterogeneous patient population within the Beacon Clinico-PSG Database. The algorithm was evaluated on 100 held-out recordings from 5 clinical institutions across 11 sites, comprising a

highly diverse population representative of patients evaluated in sleep clinics. Each recording was independently staged by 3 registered polysomnographic technologists to generate consensus ground-truth sleep staging for each recording.
Results: The automated algorithm achieved human-level sleep staging performance with per-stage positive-percent-agreements (PPA) of 89% for W, 65% for N1, 81% for N2, 90% for N3, and 92% for R. Negative-percent-agreements (NPA) were 98% for W, 95% for N1, 95% for N2, 94% for N3, and 98% for R. The algorithm achieved a macro-average F1-score of 0.77. In addition, the algorithm's median absolute error in estimating total sleep time (TST) was 12 minutes, wake after sleep onset (WASO) was 7 minutes, latency to persistent sleep (LPS) was 2 minutes, and REM latency was 1 minute. The algorithm was also able to stage recordings with the minimum number of AASM recommended EEG electrodes without a statistically significant reduction in performance. The sleep staging model was able to generate sleep stages for all 100 recordings within 26 minutes on a computer with an available GPU.
Conclusion: We demonstrate a model trained on large amounts of highly diverse PSG data that is capable of automatically staging EEG channel data from the PSG to achieve performance matching human experts. An automated staging algorithm that operates on EEG alone has the potential to rapidly provide accurate diagnostic information in a variety of neuropsychiatric conditions with a reduced testing burden, and greatly accelerate the development of novel therapies.
Support (if any):

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1080

THE SLEEP PHYSIOLOGICAL CHANGE WITH LIGHT INTERVENTIONS IN ADOLESCENTS - A MAGNETIC RESONANCE SPECTROSCOPY STUDY

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Introduction: The good sleep quality contributes to the better emotion and cognitive functions. A significant portion of adolescents in Asia shows insufficient sleep quality, which impacts the emotion such as depression and anxiety. The bright light exposure could regulate sleep and mood. The aim of this study was to figure out the sleep and emotion change after artificial bright light intervention in female senior high students, by the measurements of salivary melatonin, polysomnography and magnetic resonance spectroscopy.
Methods: There were two classes of the same senior-high school enrolled in and assigned to the control group and experimental group. During the middle to the end of semester, the students in the control group received basic sleep education. The students in the experimental group received artificial bright light exposure (500 LUX, 5000K) in the classroom from 8:00 AM to 12:00AM every morning for total 58 days. The students in the two classes had the same persistent academic stresses during this period. We randomly selected eight students from the control group and seven students from the experimental group without any diagnosis of mental disorders. Before and after the interventions, Pittsburgh Sleep Quality Index(PSQI), Hospital Anxiety and Depression Scale(HADS) were measured for sleep quality and emotion, salivary melatonin for the dim-light melatonin onset, polysomnography for sleep parameters, and brain magnetic resonance spectroscopy for excitatory/inhibitory ratio(E/I ratio). Correlation analysis was conducted to probe the association between these variables. ANOVA tests were used to examine group differences before and after the intervention.
Results: Before the intervention, these two groups showed no significant difference in the above variables. The scales for anxiety showed significantly negative correlation with sleep phase angle from all these participants. After the bright light intervention, the change of HADS showed no significant difference between groups. However, only in the control group, the sleep phase angle became longer and the E/I ratio became higher significantly, but no change in experimental group.
Conclusion: During persistent academic stress, the daytime artificial bright light exposure might have buffering effects for the adolescent students, preventing them from delaying sleep onset and over-activating the arousal system in brain.
Support (if any):

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1081

A RANDOMIZED CONTROLLED TRIAL OF ISLEEP: IMPACT ON INPATIENT DISRUPTION AND SLEEP

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Introduction: Hospitals often contribute to acute sleep deprivation in patients through modifiable disruptions. Although staff-directed interventions have proven beneficial, research exploring direct patient education and empowerment in reducing disruptions and enhancing inpatient sleep is lacking.
Methods: Patients were randomly assigned to either the I-SLEEP or standard care arm. Patients in the I-SLEEP arm received a 5-minute video emphasizing sleep hygiene and empowering them to advocate for reduced sleep disruptions. Both groups received a sleep kit. The Potential Sleep Disruptions Questionnaire measured patient-reported disruptions (vitals, tests, medications) and wrist actigraphy measured nightly sleep duration in minutes. Mixed-effects models, controlling for study day, age, gender, race, BMI, apnea risk, comorbidities (COPD or asthma, diabetes, chronic heart failure, end-stage renal disease), and subject random effects tested the effectiveness of I-SLEEP on outcomes.
Results: A total of 175 patients were randomized (95 I-SLEEP patients for 265 nights; 80 standard patients for 174 nights). Both groups were similar with respect to baseline characteristics. In unadjusted analyses, I-SLEEP patients reported fewer disruptions from vitals (63% vs. 74%), medications (49% vs. 60%), and tests (57% vs. 69%) compared to standard patients (p=0.02 for all). In adjusted analyses, I-SLEEP patients reported significantly lower odds of disruptions due to medications (OR 0.50 [0.27, 0.94], p=0.03) and tests (OR 0.44 [0.21, 0.91], p=0.026). In unadjusted analyses, although sleep duration was greater

on I-SLEEP nights compared to standard nights (334 minutes vs. 309 minutes), this difference was not statistically significant (p=0.16). Adjusted analyses confirmed these results. However, an interaction between I-SLEEP and study night revealed that patients in I-SLEEP gained an additional 15 minutes of sleep per night during the intervention, although this difference was just shy of significance (p=0.06).
Conclusion: I-SLEEP is linked to decreased patient-reported sleep disruptions from medications and tests, and a trend towards greater objective inpatient sleep for each day in the intervention. Given the importance of improving sleep in hospitalized patients, I-SLEEP emerges as a patient-centered intervention with the potential to empower patients in advocating for improved sleep quality in the hospital.
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1082

ACCREDITATION OF HOME SLEEP APNEA TESTING IN BRITISH COLUMBIA, CANADA: THE TYPES OF NONCONFORMANCE

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Introduction: Accreditation of Home Sleep Apnea Testing (HSAT) has been conducted in British Columbia (BC) since 2021. BC is one of only two provinces in Canada that require accreditation for HSAT facilities. In this study, we analyzed the types of nonconformance cited, based on the first facilities completing on-site assessments.
Methods: The accreditation process was divided into three phases: an initial attestation, a desktop audit, and an on-site assessment. In 2022-2023, we analyzed data from 46 HSAT facilities who have completed an onsite assessment based on 329 standards. The assessment approach included reviewing evidence, interviewing staff, and observing patient practices. All assessment questions were categorized and included a complete set of HSAT Accreditation Standards (1). The outcomes of these assessment activities highlighted nonconformance for the facilities to meet to obtain full accreditation.
Results: By December 2023, 46 out of 172 facilities in BC (26.7%) had completed on-site assessments, and 480 nonconformance were cited. The nonconformance identified in the on-site assessments was analyzed. Among the nonconformance, we found 105 (21.9%) in procedural and documentation areas, 78 citations (16.3%) in human resources standards, 54 (11.3%) in the medical director's duties, 38 (7.9%) in HSAT equipment evaluation and maintenance aspects, 32 (6.7%) in reporting, 29 (6.0%) nonconformance were identified in ethical standards, 28 (5.8%) in complaint and feedback processes, 22 (4.6%) were related to technical HSAT issues, 18 (3.7%) in safety and privacy and the same number 18 (3.7%) were associated with patients communication problems, 13 (5.0%) nonconformance were in scoring and interpretation area, and 34 (7.1%) in referral process, infection prevention and control, and information management groups of standards.
Conclusion: Standalone HSAT facilities will continue to play a significant role in providing diagnostic sleep services. HSAT facilities have welcomed the accreditation process to facilitate continuous patient care and safety improvement. Our study, showing the first experience of the HSAT accreditation process, strives to create a path for further research on the positive influences of accreditation programs on public health indicators.
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1083

ASSOCIATION BETWEEN SLEEP APNEA AND HEALTH SERVICE UTILIZATION: RESULTS FROM THE HEALTH AND RETIREMENT STUDY

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Introduction: Sleep apnea is associated with several health conditions known to increase the use of health services that may otherwise be preventable (e.g., hospitalization). We investigated the association of sleep apnea and the subsequent use of health services, independent of health conditions and other potential confounders.
Methods: We studied participants aged 50+ years in the 2016 and 2018 Health and Retirement Study (HRS), a nationally representative cohort of approximately 20,000 middle-aged and older adults in the United States. In 2016, participants were asked if "a doctor had ever told them they have a sleep disorder," and if so, which disorder (which included sleep apnea). We categorized participants as with and without sleep apnea. In 2018, participants were asked to report on their use of health services, including hospitalization, home healthcare, and nursing home use. We used logistic regression to determine the association between sleep apnea, as reported in 2016, and the use of health services in 2018, after adjusting for demographics, BMI, health conditions, and depressive symptoms.
Results: We studied N=20,115 HRS participants, of whom 11.8% reported sleep apnea. Compared to those without sleep apnea in 2016, those with sleep apnea had a 21% higher odds of reporting future use of any health service (Adjusted Odds Ratio [AOR]=1.21, 95% Confidence Interval [CI]=1.02-1.43), after controlling for confounders. Specifically, those with sleep apnea had greater odds of hospitalization (AOR=1.21, 95% CI=1.02-1.44), and while not statistically significant, home healthcare services (AOR=1.23, 95% CI=0.99-1.54).
Conclusion: Participants with sleep apnea had increased odds for future health service utilization, including hospitalization and home healthcare. Findings highlight the importance of addressing sleep apnea to reduce their burden on the healthcare system.
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1084

ASSOCIATION OF SOCIAL DETERMINANTS OF HEALTH AND SLEEP STUDY COMPLETION RATES IN A LARGE COHORT

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Introduction: The effects of social determinants of health (SDH) on health outcomes are well documented. However, the extent to which SDH influences sleep study completion is unknown.
Methods: A retrospective cohort study was conducted utilizing sleep study referrals at the Cleveland Clinic Sleep Center from 1/3/2017 to 8/5/2023. Adult patients who underwent sleep testing and completed at least one SDH screening questionnaire including food insecurity, financial strain, housing stability were included. A comparison between sleep study and SDH completion was conducted using Pearson chi-squared tests and Wilcoxon rank sum tests for unordered and ordered variables respectively. Continuous measures were summarized and compared with two-sample t-tests or ANOVA. Univariate logistic regression was used to measure associations between sleep testing completion rates, with SDH measures and demographic variables.
Results: Of 113,843 patients referred for sleep testing, 55% (n=62,569) patients completed at least one SDH screening questionnaire. Of these, 40% (n=25,003) completed a sleep study and 60% (n=37,556) did not. Patients who completed at least one SDH screening questionnaire were older (55.0±15.6 vs 53.5±15.8), of White race (77.7%vs76.3%, p< 0.001), non-Hispanic (95.9%vs94.9%, p< 0.001) and more likely to complete their sleep study (40.0%vs29.6%, p< 0.001) compared to those who did not complete any SDH screening questionnaire. On the other hand, the subset of patients who completed at least one SDH measure and sleep testing were older (56.0±15.65 vs 54.4±15.5, p=< 0.001), had a higher BMI 34.4±8.8vs33.8±8.3, p< 0.001) and were of Hispanic origin (4.4%vs3.8%, p< 0.001) compared to patients who did not complete sleep testing. Likewise, completers reported medium to high financial strain (15.8%vs13.7%, p< 0.001), high risk for housing stability (11.5%vs10.3%, p< 0.001) and food insecurity (9.9%vs8.9%, p=0.027) versus the subset of patients who did not complete sleep testing.
Conclusion: SDH screening questionnaires are not routinely completed by patients referred for sleep testing. However, patients who completed SDH screening questionnaires and sleep testing reported higher risk for food insecurity, housing stability and financial strain. Systematic efforts are needed to investigate the feasibility and acceptability of implementing SDH screening in sleep clinics to understand the relationship between social needs, access and utilization for sleep testing.
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1085

EVALUATING DIFFERENT MESSAGE STRATEGIES FROM THE AASM "COUNT ON SLEEP" CAMPAIGN TO PROMOTE AWARENESS ABOUT OSA

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Introduction: The American Academy of Sleep Medicine (AASM) initiated "Count on Sleep" in 2023, a public health campaign that was awarded to the AASM by the Centers for Disease Control (CDC)) and Prevention of the U.S. Department of Health and Human Services (HHS) in 2021, with the goal of raising the awareness of Obstructive sleep apnea (OSA) among general practitioners and the public. Three campaign messages were developed and disseminated via social media. We examine the impact of these campaign messages using back-end analytics from the social media platform Meta.
Methods: We downloaded impressions (number of times the message was displayed on a screen), clicks, and shares for each of three public health messages from Meta, including demographic information for users (age, gender). Three message strategies were tested: positive outcome expectations (e.g., "improve your health"); negative outcome expectations (e.g., "increase your risk of health problems"); and partner-focus (e.g., "have you heard your partner snore?").
Results: The campaign received a total of 142,607 impressions, divided into positive outcome expectation (n=120,062), negative outcome expectation (n=12,286) and partner-focus (n=10,259) messages. The campaign yielded a total of 3038 link clicks, with the highest number for positive outcome expectation (n=3,006), followed by negative outcome expectation (n=21) and partner-focus (n=11) messages. The total shares were 276, with most shares (165) for the negative outcome post. Female users were more likely to engage with the positive outcome (39% v.28%) and negative outcome (34% v.25%) messages; engagement did not vary by sex for the partner-focus message (36% v.36%). Those 65 years and older had the highest engagement of all age groups (negative outcome: 54%; positive outcome expectation: 47%; and partner-focus: 40%).
Conclusion: Although the positive outcome message strategy received the most engagement and clicks to the website for more information, the message using a negative outcome approach was the most frequently shared message. Females and older adults were more likely to engage with OSA messaging. These results provide information about the reach and uptake of OSA messages with different frames (e.g., negative/positive outcomes, partner-focus).
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1086

LITERACY PROFILE OF DIGITAL EDUCATION ON POSITIVE AIRWAY PRESSURE INTERVENTIONS GENERATED BY MACHINE LEARNING

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Introduction: Sleep apnea affects over 30 million individuals in the United States and contributes to a multitude of comorbidities among patients. Let alone, there has been a bibliometric increase in clinical research development on understanding and innovating the treatment of sleep apnea. One of the most common sleep interventions is using positive airway pressure (PAP) devices

which play a key role in maintaining the oxygen saturation of a patient during sleep. As these devices continue to be used among individuals, it is imperative to ensure patients receive appropriate education on the management of these devices. However, few clinical studies have evaluated the quality of the most commonly used digital educational materials that are designated to specifically answer questions asked by patients regarding PAP devices. This study aimed to evaluate the comprehension and readability of digital patient education materials regarding PAP modalities.
Methods: To address the primary objective of this study, a cross-sectional methodology was employed. It extracted the most frequently asked questions from the Google RankBrain machine learning algorithm and each associated educational article regarding continuous positive airway pressure (CPAP) and bilevel positive airway pressure (BiPAP) devices. Following, two independent raters evaluated questions for JAMA Benchmark Criteria and Rothwell's Classification of Questions. Additionally, these raters also utilized the Flesh Reading Ease scale and Brief DISCERN for each article to evaluate the quality, readability, and understanding of each educational material.
Results: This study extracted the first 200 frequently asked questions and educational articles on CPAP and BiPAP devices using the algorithm. Rothwell's Classification revealed 93.0% of questions were classified as "Fact" (n= 186). Within this cohort, digital patient education materials that met grade-reading level recommendations (Flesh Reading Ease ≥ 60) were found in a tighter distribution for CPAP vs. BiPAP. Brief DISCERN scores were not found to be statistically significantly associated with Flesh Reading Ease when scores met grade-reading level recommendations ($p = 0.13$).
Conclusion: The findings of this study indicate that a majority of education materials on PAP devices do not meet US grade-reading level recommendations. These results encourage healthcare providers and educators to integrate techniques that improve healthcare literacy regarding PAP modalities.
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1087

RECOGNIZING SLEEP DISORDERS IN THE US MILITARY HEALTH SYSTEM: DIFFERENCES BETWEEN ON-BASE AND PRIVATE SECTOR CARE

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Introduction: Sleep disorders such as insomnia and obstructive sleep apnea (OSA) are common and costly in the US Military Health System (MHS). Further, demand for sleep specialty care greatly exceeds available supply. Many MHS beneficiaries are referred off-base to the TRICARE network to access private sector care. The purpose of this study was to compare military, demographic, and clinical characteristics between MHS beneficiaries newly diagnosed with either insomnia or OSA on-base (direct care) and off-base (private sector care).
Methods: We identified MHS beneficiaries with a first diagnosis of insomnia or OSA between years 2016-2021 within the Military Data Repository (MDR). This large data repository includes encounter, procedure, medication, and durable medical equipment information for Active Duty personnel, dependents, National Guard, and Reserves. Demographic and military information was obtained from the MDR. Sleep disorders and medical and psychiatric comorbidities were defined based on ICD-10 diagnostic codes. Determination of direct vs private sector care was based on an indicator in the MDR.
Results: 235,823 MHS beneficiaries were diagnosed with either insomnia (n=143,877) or OSA (n=91,946). Of beneficiaries with insomnia, the majority (n=119,923, 83.4%) were diagnosed in direct care. Of beneficiaries with OSA, the majority (n=51,014, 55.5%) were diagnosed in private sector care. Between-groups differences (direct vs private sector care) were observed in service branch (standard mean difference [SMD]=0.46) and beneficiary category (i.e., Active Duty, dependent, National Guard, or Reserve; SMD=0.37), with most Active Duty (n=131,321, 81.6%) and dependent (n=26,987, 53.5%) beneficiaries being treated via direct care. No between-groups differences were observed in medical and psychiatric comorbidities. In terms of comorbid sleep disorders, of beneficiaries diagnosed with hypersomnia (n=12,403), the majority (n=10,055, 81.1%) were diagnosed in private sector care.
Conclusion: Differences in service branch and beneficiary category were observed between individuals diagnosed with insomnia or OSA in direct and private sector care. Insomnia was more likely to be diagnosed in direct care, and OSA was more likely to be diagnosed in private sector care. Future research should examine health and economic outcomes associated with direct and private sector sleep care and identify opportunities (e.g., telehealth) to bring sleep care back into the MHS.
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1088

SLEEP RESILIENCE: A DIMENSION OF SLEEP HEALTH ASSOCIATED WITH SLEEP HEALTH DISPARITIES

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Introduction: Sleep health disparity refers to variations in sleep health that negatively impact disadvantaged and underserved populations. Sleep resilience is the ability to function emotionally, cognitively, and physically in the presence of sleep disturbance. In this study, we aimed to investigate whether self-reported sleep resilience in the face of future sleep disturbance is associated with current sleep disturbance and whether this association differed based on demographic variables.
Methods: A sample of 454 participants ages 18-85 (M=45) completed an online survey through Qualtrics that included demographic variables and a novel measure of projected sleep resilience. Participants also completed the PROMIS-Sleep Disturbance and the PROMIS-Sleep-Related Impairment questionnaires. The demographic variables included age, sex (male, female, non-binary), income level, race (white/non-white), relationship status (married/not married), number of dependents, and education level. Mixture modeling was used to examine whether sleep disturbance and sleep-related impairment predicted projected sleep resilience. A follow-up class analysis was used to determine whether these associations differed across demographic variables.

Results: Greater sleep disturbance and greater sleep-related impairment predicted lower projected sleep resilience. A latent class analysis revealed 2 classes (traditionally underserved and privileged) that had significant differences in the association between sleep disturbance and projected resilience. The underserved group (Class 1) included higher numbers of women who were more likely to be non-white with lower income, less educated, unmarried, fewer dependents, and more sleep disturbance. The privileged group (Class 2) included higher numbers of men who were more likely to be white with a higher income, highly educated, married, and have more dependents and less sleep disturbance. The underserved group projected lower future sleep resilience holding current sleep disturbance constant than the privileged group.
Conclusion: Sleep resilience is an important dimension of sleep health that is often overlooked and understudied. Our findings suggest that sleep resilience is lower in traditionally underserved individuals, which may compound sleep health disparities. Having lower projected sleep resilience in the face of future sleep disturbances may increase current stress levels and negatively influence sleep health behaviors. In an effort to rectify sleep health disparities, targeting the factors that contribute to lower projected sleep resilience may be a fruitful avenue.
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1089

USING COMMUNITY ENGAGEMENT TO INCREASE UTILIZATION OF PRIMARY CARE FOR SLEEP CONCERNS IN COMMUNITIES OF COLOR

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Introduction: Growing evidence suggests that there are sleep health disparities in the United States that disadvantage communities of color, and other socioeconomically marginalized groups in medical and mental health settings. Research in public policy indicates several points of intervention for increasing engagement with treatment services in communities of color at the primary care level, including individual beliefs about mental health/health issues, and perceptions of various points of treatment engagement, as well as community factors (e.g., neighbors and church; Davey & Watson, 2007). Accordingly, the current study implemented a community-level virtual intervention that targeted beliefs about sleep and perceptions of behavioral sleep treatment with the aim to increase willingness to engage with treatment at the primary care level.
Methods: We conducted 12 semi-structured qualitative focus groups with 35 individuals from communities of color about their awareness, perception of, and access to behavioral sleep treatment in healthcare settings. Transcripts were coded using the Rapid and Rigorous Qualitative Data Analysis method for themes relevant to the guiding question, 'What are people/persons of color experiences and perspectives of sleep, and specific areas of improvement to increase people/persons of color groups' utilization of behavioral sleep services?'.
Results: After a brief period of education (range = 15-20 minutes) about cognitive-behavioral therapy for insomnia (CBTi), participants perceived behavioral sleep treatment as a favorable option both over and in conjunction with pharmacological options. Medical mistrust was mentioned as the most significant barrier in each focus group, with participants highlighting that increased attention to collaborative care and comprehensive education about treatment options at the primary care level would be helpful for reducing mistrust. Pre- and post-group survey analysis indicated a significant increase in participants' willingness to use primary care as an entry point to access/utilization of behavioral sleep treatment (pre-group willingness = 54.84%, post-group willingness = 91.42%, p<.001).
Conclusion: Findings suggest that intervention at the community level can be powerful for increasing the willingness of communities of color to engage in treatment at the primary care level. It is paramount that future research continues to examine ways to increase engagement with behavioral sleep treatment to help reduce sleep health disparities.
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1090

UTILIZATION OF ADVANCED PRACTICE PROVIDERS IN A PEDIATRIC SLEEP PROGRAM: A STRATEGY FOR EXPANSION AND OUTCOMES

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Introduction: With the increasing demand for sleep services and a declining number of board-certified sleep physicians, pediatric sleep centers are seeking ways to meet the demand of managing sleep disorders identified by polysomnography. Employment of advanced practice providers (APPs) is a strategy to bridge this gap in healthcare access. Currently, there is no literature describing expansion of a pediatric sleep program with APPs including orientation, utilization, and outcomes. Objectives: 1: Describe the curriculum/orientation and clinic scheduling; 2. Report patient satisfaction and access to care outcomes; 3. Explain how utilization of APPs has led to program expansion and community outreach.
Methods: Narrative review of the curriculum and program expansion. Retrospective review of Press Ganey scores and clinic volumes including third next available appointment (TNAA) data.
Results: The sleep laboratory expanded from 14 to 23 beds; therefore, 3 APPs were hired between December 2018 and August 2019 with one having sleep medicine experience. Orientation included reading assignments, didactic lectures, and ~450 clinical hours in sleep, otolaryngology, pulmonary, neurology, craniofacial surgery, and psychology clinics. Clinic schedules after orientation started at 25% of the expected patient volume and increased quarterly by 25%. 3,358 patients were seen by the APP team in the first fiscal year which was an ~92% clinic volume increase. TNAA decreased from 34 to 5 (-29 days). According to Press Ganey survey metrics, APPs' top box scores were 1.28 points higher (86.6) than the collective physician and clinic scores increased by 5 percentile ranks (86.1). APPs have also been involved in multidisciplinary clinics including the Bariatric Surgery Program and Multidisciplinary Obstructive Sleep Apnea Clinic. Blog publications and community talks have been given regarding sleep training and sleep disorders in school age children. Performance evaluations have not indicated safety or quality concerns related to care delivery. Two APPs were onboarded in 2023 with another position pending approval.

Conclusion: We identify a detailed strategy using various metrics to help meet the demand of sleep services for pediatric sleep centers. Utilizing APPs can potentially increase patient satisfaction and access to care while maintaining high reliability and quality care of the institution's sleep medicine practice.
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1091
"IF YOU SLEEP, YOU HAVE MISSED IT": PERCEPTIONS OF SLEEP AMONG LONG-DISTANCE DRIVERS IN ILE-IFE, NIGERIA

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Introduction: Road Traffic Accidents (RTAs) are a major cause of mortality and disability in developing countries. Previous studies suggest that one-third of road traffic accidents are due to drowsy driving. The frequency and causes of drowsy driving in Nigeria are unknown as there is limited data and publication on the subject. Hence, this study was carried out as part of an awareness program for the 2023 World Sleep Day to explore the perceptions and determinants of poor sleep among long-distance drivers in Ile-Ife.
Methods: A cross-sectional qualitative study was conducted with a focus group conducted among 12 leaders of drivers in Ile-Ife. Ethical approval and consent were obtained beforehand. Participants were asked about their perception of sleep with a pre-developed interview guide. Their responses were recorded and transcribed verbatim, and ATLAS.ti 22.3 was used to manage the data. Thematic analysis was done, and sample quotes were documented.
Results: All respondents were male aged 45 to 52 years. The drivers described their sleep as not sufficient as they leave for work early and return late. A recurrent response was; "sleep is very important, but for people like us, sleep is not sufficient." Four factors were identified that affect sleep quality: financial debt, responsibilities, drinking alcohol for recreation, and distance traveled. Participants reported that they work longer hours to be able to pay for the hired buses they drive, alongside responsibilities such as payment of children's school fees, as described; "Had it been that one has a basic salary; one can sleep conveniently till 9 am." The drivers also added that they prefer to drink alcohol and have fun after work, which affects their sleep. Additionally, drivers who travel intra-state return early and sleep more.
Conclusion: Commercial drivers are at an increased risk for drowsy driving and, consequently, are at risk for RTAs. This study highlights the multifactorial and socioeconomic challenges that influence sleep quality among long-distance drivers in South West Nigeria. Further studies are required, and educational and economic measures are recommended to be implemented to reduce this risk.
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1092
WITHDRAWN

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1093
TIKTOK MADE ME DO IT: AN ANALYSIS OF THE SCIENTIFIC EVIDENCE SUPPORTING TIKTOK'S RECOMMENDATIONS FOR BETTER SLEEP

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Introduction: Like it or not, the public looks to social media for health advice. In one large survey, adults listed social media as their second place for health information following their primary care provider, and most individuals reported that they do not verify the accuracy of information with a healthcare provider. Given the public's apparent confidence in health advice shared on social media, it is important that content creators share medically sound advice. To that end, we sought to understand the scientific evidence supporting sleep tips shared on TikTok.
Methods: We transcribed the most-viewed TikTok videos on November 15-16, 2023, that used the tag #sleephacks, #sleephygiene, or #sleeptips. Two researchers coded each video to identify all sleep tips; a third researcher coded >25% of videos for validity. A total of 295 sleep tips (including repeated recommendations) were coded across 58 videos. Tips were then organized by theme and were compared to findings from empirical articles in peer-reviewed journals on Google Scholar. Research-based evidence in support of sleep tips was defined as shorter sleep latency, longer sleep duration, more slow-wave or rapid eye movement sleep, higher sleep satisfaction, or less daytime sleepiness in randomized or non-randomized controlled trials or correlational (cross-sectional regression) associations.
Results: N = 35 unique sleep tips were identified, grouped around 7 themes: calming activities (e.g., breathwork prior to bed), use of electronics (e.g., limiting screen time before bed), environment (e.g., sleeping in a cool, dark room), foods/substances to avoid (e.g., caffeine before bed), foods/substances to use (e.g., magnesium), schedule (e.g., consistent bed and wake times), and other sleep-related behaviors (e.g., mouth taping). Of the 35 tips, we found empirical support for 33, of which 26 had evidence from randomized controlled trials, 2 were supported by controlled trials without randomization, and 5 were backed by correlational associations.
Conclusion: Most sleep tips shared on TikTok are supported by empirical evidence. While much of the health advice shared on the platform remains unregulated and unreviewed by health professionals, current information about sleep hygiene and sleep environment is generally backed by scientific support.
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1094
WHO GETS THE STIM?: A DEMOGRAPHIC ANALYSIS OF HYPOGLOSSAL NERVE STIMULATOR PATIENTS

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Introduction: In addition to traditional demographic analysis, Geographic Information System (GIS) tools, provides a unique methodology that allows us to spatially analyze data and capture geographic data related to HNS patients. This study seeks

to create geographic maps related to socioeconomic attributes of HNS patients in addition to relevant demographic and clinical data to better understand potential barriers to care for those seeking treatment for obstructive sleep apnea (OSA).
Methods: A retrospective study was performed of patients who underwent HNS implantation at a tertiary care academic hospital from August 2011 to October 2021. Relevant demographic and clinical characteristics were captured for each patient, both pre- and post-operatively. GIS was used to geocode patient addresses and perform spatial analyses to capture socioeconomic dynamics that may produce barriers to care for vulnerable populations. Maps were produced identifying distribution of patients relative to median household income, Area Deprivation Index (ADI), and drive times to the hospital.
Results: 229 patients were included in this study. 167 patients were male and 62 were female. 222 patients implanted during this period identified as Caucasian. When considering median home value, median household income, and Area Deprivation Index, the cluster of patients within Pittsburgh most often lived in more affluent areas. However, more than 50% of patients lived greater than a 30-minute drive from the hospital where surgery and clinic appointments occurred. 90% of patients lived within 60 minutes of the hospital.
Conclusion: As hypoglossal nerve stimulation (HNS) continues to expand its footprint in the treatment of patients with obstructive sleep apnea (OSA), there is a dearth of demographic studies related to the populations currently being served by this treatment modality. This study uniquely seeks to meld clinical data with socioeconomic information to better understand recipients of HNS.
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1095

ADAPTATION OF SIESTA (SLEEP FOR INPATIENTS: EMPOWERING STAFF TO ACT) PROTOCOL FOR ACUTE STROKE REHABILITATION

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Introduction: Improving sleep for patients with stroke is vital due to the importance of sleep for neuroplasticity and functional recovery. While sleep interventions have been successful in reducing nocturnal disruptions for hospitalized patients, few interventions have been tested for patients with stroke in an acute rehabilitation setting. We aimed to adapt the successful hospital protocol SIESTA (Sleep for Inpatients: Empowering Staff to Act) to an acute stroke rehabilitation setting.
Methods: Surveys and focus groups with nurses caring for patients with stroke on inpatient floors at Shirley Ryan AbilityLab informed the development of the adapted protocol, SIESTA-Rehab. The protocol included educational video modules for nurses regarding sleep hygiene and sleep apnea screening, sleep enhancing measures (eye masks, quiet signs), a nurse badge card with a checklist reinforcing protocol components, and advocacy for patient sleep at shift handoff. Two nurse champions were recruited to monitor protocol implementation. Periodic re-education was conducted to account for nurse turnover. Ongoing fidelity interviews using the Consolidated Framework for Implementation Research (CFIR) framework assessed intervention perceptions.
Results: We initially trained 27 (93%) nurses using the training module. Fidelity interviews of over 20 nurses in the years post-implementation demonstrated over 57% of nurses recalled sleep masks and "cluster care" as part of the protocol. Moreover, more than 75% of nurses considered the protocol to be "straightforward" and "part of the workflow." Nurses perceived the protocol positively, noting it "could be really beneficial for patients and their long-term health," and have incorporated behavioral changes into their routine since being educated on sleep hygiene. Nurses also reported understanding the importance of sleep for stroke patients, stating sleep "helps in their recovery and feeling well rested for the day so that they can participate in therapy" and understood "how [they] affect that in [their] roles" as nurses.
Conclusion: The SIESTA protocol can be successfully adapted to an acute rehabilitation setting for stroke patients, as evidenced by positive staff responses to sleep-promoting interventions, ease of protocol incorporation, and high staff compliance. Ongoing work is investigating patient perceptions and outcomes following implementation of this sleep protocol.
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1096

ATTITUDES TOWARDS MENTAL HEALTH SERVICE FOR SLEEP SCALE (AMHSUS): DEVELOPMENT AND PSYCHOMETRIC EVALUATION

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Introduction: Poor sleep health is prevalent at the population level and is especially high among college students. There are numerous evidenced-based mental health treatments for sleep disturbance [e.g., Cognitive Behavioral Therapy for Insomnia (CBT-I) and mindfulness-based therapies], but mental health care for sleep continues to be underutilized. The novel Attitudes Towards Mental Health Service Utilization for Sleep (AMHSUS) scale was developed to assess attitudes towards the use of mental health services for sleep disturbance to gain a fuller picture of individual and population-level barriers and facilitators.
Methods: An initial 20-item scale covering four hypothesized dimensions was developed via team consensus, then refined and reduced to 16 items in response to feedback from a graduate student panel. The scale was tested using a sample (n=367) of university students (Mage= 19.0; female= 71.1%; white=43.1%; Black= 31.3%) in the southern region of the United States.
Results: An exploratory factor analysis yielded four factors: "Severity," "Facilitators," "Barriers," and "Priority." All but one of the original items were retained. The total scale demonstrated good internal consistency, with a Cronbach's alpha of .71. Reliability was appropriate for two of the four factors, "Severity" ($\propto$=.83) and "Facilitators" ($\propto$=.82), but questionable for "Barriers" ($\propto$=.63) and poor for "Priority" ($\propto$=.46).
Conclusion: Future directions include testing the scale for convergent and discriminant validity, revising the "Barriers" and "Priority" subscales, and removing items as needed. AMHSUS shows strong psychometric potential and, with some modifications, will be a valuable tool for sleep health research.
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1097

EDUCATION INTERVENTION IMPROVES SEDATIVE USE FOR HEALTHY SLEEP & INSOMNIA MANAGEMENT

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Introduction: Individuals with higher self-efficacy in managing their hypnotics and sedatives use are more likely to adhere to prescribed dosages, follow recommended guidelines, and make necessary behavioral changes. Self-efficacy also influences an individual's decision-making regarding their health and treatment regimen. Misuse or improper use of sedatives and hypnotics poses risks such as dependency, adverse effects, and potential addiction. Enhancing patients' self-efficacy in handling their medication intake could potentially mitigate these risks and promote safer usage.
Methods: The study was a single-arm interventional pre-and post-assessment study conducted nationwide in eight counties. The intervention was a well-consensus health education program. A self-report five-item questionnaire with good psychometrics (0.8 expert content validity and 0.9 internal consistency reliability) assessed the self-efficacy of proper use of hypnotics and sedatives.
Results: Eight institutions across different regions recruited 875 participants comprising elderly (n=337, 38.5%), workers from high-risk workplaces (n=415, 47.4%), native aborigines (n=95, 10.9%), youths (n=117, 13.4%) and others. The participants aged 58.3 ± 17.6 years and half were male (n=447, 51.1%). The self-efficacy of using hypnotics and sedatives was significantly improved after the educational interventions (the changed scores 0.16 ± 0.45, p <.001). After the educational intervention, the participants could re-establish their bedtime routine (e.g., a calmy environment, no 3Cs use), express their sleep disturbance to the physician, learn the medications comprehensively, and keep adherent to the treatment regions, etc.
Conclusion: The intervention, which focused on improving the self-efficacy of proper use of hypnotics and sedatives, resulted in a notable enhancement in participants' abilities. A statistically significant improvement was observed in their self-efficacy scores post-intervention, indicating a positive impact of the educational program. Notably, participants exhibited an improved capacity to re-establish healthy bedtime routines. Additionally, they demonstrated better communication with healthcare professionals regarding sleep disturbances, a comprehensive understanding of medications, and increased adherence to prescribed treatment regimens.
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1098

HYPOGLOSSAL NERVE STIMULATION PROGRAM ANALYSIS AND FINANCIAL IMPACT OVER 6 MONTHS

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Introduction: Inspire hypoglossal nerve stimulation (HNS) is being increasingly utilized as an alternative treatment for moderate to severe obstructive sleep apnea in select patients who fail positive airway pressure therapy. There is substantial cost and effort in developing an HNS program. We report on a programmatic and financial analysis in a non-academic, community-based sleep center 2 years into its HNS program.
Methods: A retrospective review of all clinic visits was performed for a 6-month period from January 2022 through June 2022. Visits were reviewed as being referred for, or discussing HNS as a treatment option, for inclusion in the analysis. Included visits were categorized as new or follow up visit, and data was extracted including referring provider specialty, insurer, and if the visit resulted in ordering of a sleep study, referral to ENT, if the patient qualified for HNS, and billing for interrogation/programming of the stimulator. Financial impact was estimated by multiplying the average reimbursement rate for associated CPT codes by the number of CPT's generated.
Results: During this study period, our HNS program generated 215 patient visits, which accounted for 9% of total clinical volume. 81 were new evaluations and 134 were follow-ups. Of the new patients, 77 were referred for interest in HNS, most commonly from primary care or self-referred (33% each). Forty-four polysomnograms and 18 home sleep apnea tests were performed related to these visits. A total of 93 HNS programming/interrogation services were performed. The total revenue generated across all services was estimated at $83,276.
Conclusion: This observational program analysis revealed that offering HNS services generated a significant number of clinic visits, sleep studies ordered, and device interrogation services, accounting for increased clinical and study revenue. Marketing appears to have generated a significant number of self-referrals. Future research could include further analysis over a longer period of time and at other sleep clinic settings in an effort to make the results more generalizable.
Support (if any): None.

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1099

IMPACT OF GOOD SLEEP ON RECOVERY AND CARE EVALUATION (IGRACE)

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Introduction: Sleep is imperative to health and healing. Hospitalization may severely disrupt sleep. Our IRB-approved study aimed to evaluate sleep quality and patterns among patients admitted to general medical wards in two major teaching hospitals. It focused on understanding sleep disruption

during hospitalization, intending to implement better sleep hygiene practices for inpatients following this pilot study.
Methods: Ninety patients hospitalized for two or more nights were included in this IRB approved cross-sectional study, using a 14-item questionnaire to assess sleep quality, use of over the counter pharmacological (e.g. melatonin) and non-pharmacological (eye masks and earplugs) sleeping aids. All patients were English speaking, 18 or older, and admitted to the general medicine teaching floors. Patients were excluded if pregnant, incapacitated, encephalopathic, or had a known sleeping disorder.
Results: Results revealed a 100% completion rate for interviewer-led surveys, with 58.9% of patients being male, 41.1% being female. When asked about sleep quality at home, about 30% rated their quality of sleep as poor or very poor, meanwhile in the hospital 64.4% of people rated their sleep as poor or very poor. Among our participants, when asked about their experience in the hospital, 55.5% stated they had difficulty falling asleep often or always, with 67.8% often or always having difficulty staying asleep. Prior to coming into the hospital, about 43.3% of participants had at least occasionally used sleeping aids in the 30 days prior. Only 28.9% of patients were offered a sleeping aid during their hospitalization, yet of those not offered, 56.3% wished they had been offered sleeping aids. Of those who used sleep aids, 42.9% said they were very helpful, 57.1% found them somewhat helpful.
Conclusion: In conclusion, the study highlights a significant decline in sleep quality among hospitalized patients compared to home settings. Patients faced challenges falling and staying asleep while hospitalized, and those not offered sleep aids expressed a desire for them. The study underscores the potential benefits of interventions to improve sleep quality and quantity for hospitalized patients. The high efficacy of sleep aids among recipients suggests the potential positive impact of interventions targeting sleep improvement for inpatients.
Support (if any):

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1100

INNOVATIVE SKILLS BASED WORKSHOP ON ADVANCED POSITIVE AIRWAY PRESSURE DEVICES FOR SLEEP

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Introduction: Chronic advanced respiratory assist device (RAD) management for complex sleep related breathing disorders is an overlooked area in sleep and pulmonary medicine education. Robust educational curriculum on practical management of advanced PAP therapies in sleep medicine fellowship programs is lacking. This void led our team to design innovative practical hands-on skills workshop to help facilitate learning.
Methods: Sleep faculty with area of expertise in education, sleep, medicine, and pulmonary fields designed a practical skills workshop titled "NIV skills workshop" consisting of introductory briefing, 3 clinical vignettes and post session debriefing. Cases were developed to highlight strategies on empiric use, PAP mode selection, setting adjustment and troubleshooting for complicated sleep related breathing disorders including neuromuscular disorders and hypoventilation to improve knowledge and comfort with prescription and management of the devices. RPSGTs helped with conduction of workshop with 3 stations, each dedicated to a clinical case with devices available to practice adjustments based on clinical scenarios. The learners rotated through these stations with a faculty moderating each case. Pre and post session surveys were conducted to assess workshop effectiveness in improving participants' level of comfort in modality selection, empiric settings, adjustment, and troubleshooting. Participants responded with numerical values based on Likert scale. A paired t-test was conducted to assess pre and post workshop skills gain. The workshop was conducted for 2 consecutive sleep fellowship batches and thus survey results were obtained from all the leaners(n=6)
Results: Improvement in mean scores was noted in level of confidence in PAP modality selection (3.3 vs. 4, p= 0.05), empiric device settings (2.3 vs. 3.7, p=0.0007), complex PAP therapy adjustment (2.6 vs. 3.7, p=0.006) and dyssynchrony troubleshooting (2 vs. 3.8, p=0.0009). High mean scores of 4.5 and 4.8 (scale of 0-5) were noted for confidence in RAD management skills and impact on clinical practice from workshop.
Conclusion: In addition to conventional didactic teaching on advanced PAP management, a practical hands-on workshop is a highly effective tool to improve trainees' knowledge and confidence in chronic advanced device management and should be incorporated as integral part of curriculum. Such workshops should be extended to learners across the spectrum of training.
Support (if any):

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1101

LONG-TERM TRENDS IN UTILIZATION OF SLEEP DIAGNOSTIC TESTS AMONG MEDICARE BENEFICIARIES

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Introduction: Evidence underlines the association between disordered sleep and adverse health outcomes such as, hypertension, cardiovascular and cerebrovascular disease, and metabolic disorders. A variety of sleep test modalities are available, ranging from ambulatory single-channel sleep tests to in-lab technician-supervised polysomnography (PSG). These tests are selected by the clinician based on the patients overall health profile, which sleep disorders are being investigated, and which tests are covered by insurance providers. The aim of this research was to evaluate trends in utilization of different sleep diagnostic tests among Medicare beneficiaries.
Methods: A retrospective analysis of sleep test utilization was conducted using a public data set curated by the Center of Medicare and Medicaid Services. Available data included information on services, categorized by HCPCS or CPT code, submitted and paid charges, beneficiary demographics and health characteristics for the years 2011 to 2021.
Results: From 2011 to 2021, sleep service utilization among Medicare beneficiaries decreased from 803,280 to 694,375 with a peak of 963,780 procedures in 2018 (-13.6%; Compound Annual Growth Rate (CAGR) = -1.4%). Despite a slight decline in overall sleep studies, unattended type 3 studies / Home Sleep Apnea Tests (HSAT) grew by 632.6% (CAGR = 22.0%), and replaced attended sleep studies as the main diagnostic test for sleep disorders. Attended sleep studies and split-night study utilization

almost halved over the period analyzed (-44.9% and -45.6%, CAGR = -5.8% and -5.9%), while the share of unattended studies / HSAT grew from 4.7% in 2011 to 34.5% in 2021. When excluding the pandemic years 2020 and 2021, overall sleep study utilization grew by 18.0%. This development was entirely driven by increased use of unattended type 3 studies / HSAT (+616.5%; CAGR 25.2%), while attended sleep studies and split-night studies decreased by -15.5 and -7.3% respectively (CAGR -2.4% and -1.7%).
Conclusion: Utilization of sleep diagnostic tests among Medicare beneficiaries underwent significant changes since 2011, with a large shift occurring from in-lab sleep studies to simpler unattended at-home tests. While attended sleep studies, such as in-lab PSG, split-night titrations and vigilance tests were already declining before the pandemic, this event accelerated the transition towards at-home diagnostic testing.
Support (if any):

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1102
MUSEUM-BASED SLEEP EDUCATION: DEVELOPMENT AND EVALUATION OF POP-UP EXHIBITS FOR CHILDREN AND FAMILIES

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Introduction: Museums are highly credible communal spaces where people can come together to learn. This immersive environment offers opportunities to engage briefly but meaningfully with the public about sleep health. We developed interactive pop-up exhibits with activities that introduced children to sleep science and encouraged families to change sleep behaviors. We evaluated their efficacy via observational data and visitor survey responses.
Methods: We held 11 pop-up exhibits in a medium-sized children's museum from June to December 2023. Each exhibit lasted two hours and was designed to communicate three learning objectives: sleep is good, the sleeping brain is active, and changing nighttime behaviors can improve sleep. Pop-up exhibits included professional signage; take home sleep tips and stickers; videos to display sleep laboratory activities and interesting sleep facts; magnetic "electrodes" and a 3D-printed brain for learning about polysomnography; brain maze coloring sheets, and an inflatable dinosaur fitted to a CPAP mask (REM-ee the dino-snore-us). Each exhibit was staffed by 3-4 trainees (undergraduate to post-doctoral level) and observational data were collected by museum staff. Post-visit survey data in adults assessed participant demographics, meeting of learning outcomes, interest in recommending the exhibit to a friend, prioritization of sleep (0 to 100 scale), and changes in one's perception of what a scientist looks like.
Results: 1,336 people visited the sleep exhibits (32% of total museum visitors). Adult visitors (18+) were invited to complete a post-visit survey (N=102; M=37.25 years; 63.7% female; 37.25% non-white). Survey responses indicated that most learning objectives were met (89.2%), that most visitors would recommend the exhibit to a friend (91.2%), that visitors' prioritization of sleep changed from 67.9% before the exhibit to 87.5% after the exhibit ($p<.001$), and that many visitors intended to change their sleep habits (73.5%). More than half of visitors (62.2%) reported that their perception of a scientist had changed (e.g., demographically diverse, friendlier).
Conclusion: Pop-up museum exhibits are a feasible and effective method for communicating sleep information in local communities. Additional work is needed to determine whether permanent installations of sleep exhibits retain their efficacy when sleep experts are not actively staffing the exhibit.
Support (if any): National Science Foundation (1920730 and 1943323).

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1103
OUTCOMES OF INTERVENTIONS TO REDUCE PEDIATRIC SLEEP STUDY INTERPRETATION TIME

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Introduction: Nationwide Children's hospital (NCH) Sleep Center mission is to improve overall health through increased access to diagnosis of sleep disorders. Timely sleep study reporting avoids delay in recognition of sleep disorders and enables early intervention. NCH Sleep center providers completes urgent sleep study interpretations within 24 hours. Delay in sleep study interpretation of non-urgent sleep studies has been a patient and referring provider dissatisfier.
Methods: Aim Statement: The project will decrease the time to interpretation of non-urgent sleep studies for outpatient NCH ENT referrals from a baseline of 11 days to a goal of 7 days, accomplished by June 30 th, 2023, and sustained for 1 year. Key Drivers: • Provider workload • Provider expectation • Scoring delay • Workflow technical issues Interventions: • Change provider sleep reading rotation to 1 week • Study number/provider capped to 25/week • Study allocation criteria established • Report templates streamlined • Scoring for weekend studies implemented • Request platform for workflow management
Results: A total of 270 children were referred by NCH ENT and underwent non-urgent overnight polysomnograms from January 2023 to July 2023 as compared to 180 children from January 2022 to July 2022. The time to interpretation of non-urgent studies ordered by ENT specialists reduced from an average of 11 days (SD 7.1 days) in 2022 to an average of 4.5 days (SD 3.3 days) in 2023 (Jan-June).
Conclusion: Our results indicate that process improvement in the pediatric sleep lab using quality improvement methodology can be utilized to improve patient experience and meet referring provider expectations.
Support (if any):

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1104
PERSONALISATION OF BREATHING COMFORT FOR CPAP USERS THROUGH A MACHINE-LEARNING ALGORITHM

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Introduction: Many factors impact CPAP adherence, some common issues include trouble falling asleep, difficulty breathing

against pressure, and being disturbed by high pressures. Various settings to address breathing comfort have been developed, such as ramp time, reducing pressure during exhalation, and APAP response rate, though evidence of their impact is minimal. We sought to develop a machine-learning model to recommend personalised combinations of comfort settings at setup with the goal of improving CPAP adherence in patients newly starting CPAP therapy.

Methods: Data sets from 718,421 anonymous OSA patients (myAir, ResMed) were used to create the machine-learning model (MLM). The model was developed using a causal inference approach to control for bias from observational data and utilised features such as age, sex, diagnostic AHI, mask type and start pressure to predict optimal comfort settings for various patient types. These comfort settings can then be applied on an individual level. A proof-of-concept, double-blinded, randomised controlled study was conducted with people newly diagnosed with OSA (AHI≥5) and indicated for CPAP therapy attending a sleep clinic. The primary outcome was treatment continuance after 30 days comparing those set up on MLM vs default comfort settings (control).

Results: 58 patients (26% female, mean age 49.9±14.9, 46.6% non-white, mean diagnostic AHI 43.6±30.4) were included in the study analysis. At 30 days the MLM group had greater treatment continuance vs control (96% vs 80%) though not statistically significant. All other endpoints were also not statistically significant. 54% of MLM group had zero setting changes vs 37% control. In this subgroup, MLM showed increased average daily usage (+46.9min), number of days used (+2.9days), and number reaching CMS compliance (+11%), however these endpoints did not reach statistical significance.

Conclusion: This program developed a machine-learning model to predict optimal comfort setting combinations for individual CPAP patients to improve CPAP adherence. The proof-of-concept study did not reveal any harm to patients assigned personalised settings and showed some trends towards positive outcomes. Personalising comfort settings may benefit new CPAP patients, however a larger study is required to fully validate the machine-learning model.

Support (if any): Funded by ResMed

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1105

RELEVANCE OF ATTRIBUTES AND PREFERENCES FOR AT-HOME DIAGNOSTIC TESTING DIFFER AMONG PATIENTS WITH SLEEP DISORDERS

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Introduction: The diagnostic workup for assessment of sleep disorders commonly involves an overnight test to assess sleep patterns and identify pathological events. So far, little is known about preferences for the provision of home sleep tests to patients with disturbed sleep. This study aims to close this gap by eliciting preferences and relative importance of attributes of home sleep testing using a discrete choice experiment (DCE).

Methods: A DCE with seven attributes of at-home overnight sleep testing and three levels per attribute, which were selected based on previous qualitative research, was developed using a fractional factorial design. Patients with and without previous sleep testing experience were recruited from two large third-level sleep centers in Germany. The DCE was administered to patients with paper-based forms during their visits to the outpatient clinics. Coefficients for attribute levels were calculated using a conditional logit model with effects coding to estimate their influence on choice decisions and calculate the relative importance of each attribute.

Results: 305 patients (age 54.5 ± 13,1 years, male gender 65.3% were enrolled), and 288 surveys with complete data were included for analysis, which resulted in 1,152 choice decisions available for analysis. All of the attributes, except "Diagnostic accuracy" of sleep study had statistically significant influence on choice decisions. Attributes with the greatest relevance were "Waiting time to discuss sleep study results"; "Waiting time to conduct sleep study", and "Sleep quality during measurement". Of lowest importance was "Diagnostic accuracy" of sleep study, followed by "Effort to apply sleep study device", and "Device logistics". Significant heterogeneity in choice behavior was found, including differences by gender, willingness-to-pay for sleep studies, preferred sleep study location, and previous experience with sleep studies. Preferred location for conducting the sleep test was at-home in 50.7% and in-lab in 46.9%.

Conclusion: Preferences and relative importance of home sleep test attributes vary among different subgroups. Considering those preferences and their relevance is important for clinicians and policy-makers when designing individual patient-centric care pathways and high-level planning of diagnostic testing policies for sleep disorders.

Support (if any):

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1106

PATIENT-CENTRIC DESIGN: INCORPORATING PATIENT INPUT INTO A CLINICAL STUDY OF IDIOPATHIC HYPERSOMNIA AND NARCOLEPSY

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Introduction: Jazz DUET (Develop hypersomnia Understanding by Evaluating low-sodium oxybate Treatment; NCT05875974) is a phase 4, prospective, multicenter, single-arm, open-label interventional study that comprehensively evaluates low-sodium oxybate effects on sleep architecture and daytime/nighttime symptoms in participants with idiopathic hypersomnia or narcolepsy. Multiple assessments, including overnight polysomnography (PSG), are needed to generate robust, relevant data, but these assessments may impose a burden on study participants. A patient advisory board was convened to understand patient perspectives and assess opportunities to incorporate patient feedback into the study protocol.

Methods: Advisors completed a premeeting survey, then attended a 3-hour advisory board meeting with the study sponsor. Five main topics were discussed: feasibility of oxybate washout for participants entering the study on treatment, burden of assessments, relevance of specific symptom evaluation to participants, value of reporting individualized data back to participants, and burden of overnight visits.

Results: The advisory board included 2 people with idiopathic hypersomnia and 4 people with narcolepsy. All 6 advisors had experience with patient advocacy, and at least 1 had been a

clinical trial participant; these experiences may help give voice to a broader patient community. Premeeting survey responses were reviewed and discussed during the meeting. Based on advisor input, the final study protocol incorporated several points, including support for participants undergoing oxybate washout (eg, transportation, childcare, and meal service, as needed), additional breaks between assessments, moving assessments from evening to morning to reduce participant burden, measuring fatigue separately from sleepiness, and suggestions to make participants more comfortable for overnight visits. Advisors noted the high value of reporting individualized data back to study participants—particularly PSG data, with specific interest in number of awakenings, duration of rapid eye movement sleep, and duration of slow-wave sleep. In addition to these changes, study materials were developed to help participants prepare for overnight visits, and a checklist of items to bring to these visits was created.

Conclusion: The final DUET study design incorporated patient-centric elements recommended by a patient advisory board. Implementation of these elements is anticipated to reduce participant burden, improve participant experience, enhance recruitment and retention, and facilitate collection of meaningful and comprehensive data.

Support (if any): Jazz Pharmaceuticals

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1107

FACILITATING ACCURATE SLEEP DIARY DATA COLLECTION AND PROCESSING BASED ON COMMON PARTICIPANT DATA ENTRY ERRORS

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Introduction: Sleep diaries are the gold-standard measure of self-reported sleep parameters; however, data utility is contingent upon accurate data entry and clarity of standardized diary terminology/calculations between participants and researchers. Informed by the RESTING study, an effectiveness-implementation RCT of cognitive-behavioral therapy for insomnia, sleep diary dataset, the current study elucidates common participant sleep diary entry errors to inform standardizable research strategies for minimizing post hoc inaccuracies.
Methods: RESTING Study participants (N=245) with insomnia disorder completed Consensus Sleep Diaries through REDCap at baseline. Embedded survey data validation prompted participants to check unexpected values (e.g., calculated TIB >10 hours). Researchers reviewed diaries weekly, correcting immediately apparent errors. Post hoc data cleaning scripts flagged sleep diaries with potential inaccuracies based on: (1) 9 hours< Calculated Total Sleep Time (TST)< 4.5 hours, (2) Difference between calculated and self-reported TST >2 hours, (3) 100%< Sleep Efficiency< 45%, (4) Difference between lights out (LO) and bedtime (BT)< 0, or (5) Difference between rise time (RT) and wake time (WT)< 0. Researchers examined internal consistency within flagged diaries and across all entries by a participant.
Results: 3,382 days of sleep diary data were submitted at baseline (98% of expected). During active data collection, researchers corrected errors within 61 (1.8%) unique diaries, completed by 37 participants. Of 503 (14.9%) distinct sleep diaries (among 173 participants) flagged by post hoc scripts, 173 (5.1%) contained at least one error. Examining internal consistency across diary dates when reviewing flagged entries revealed 20 additional diaries with errors, among 2 participants. In sum, 348 errors were made among 119 participants. The most common errors were: confusion between WT and RT (n=150), confusion between BT and LO (n=45), inclusion of multiple sleep parameters within self-reported "wake after sleep onset" (n=29), unambiguous typos (n=29), and AM/PM mix-ups (n=28).
Conclusion: Despite training participants on sleep diary completion and utilizing survey data validation, 5.7% of diaries contained errors corrected post hoc. This highlights the importance of standardizing use of post hoc data cleaning scripts. Common errors identified can inform best practices for embedded sleep diary data validation and development of sensitive, precise protocols for reviewing diaries throughout data collection.
Support (if any): 1R01AG057500

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1108

PRIOR-NIGHT SLEEP PREDICTS NEXT-DAY SYMPTOMS OVER TEN DAYS AMONG MILITARY PERSONNEL WITH SLEEP PROBLEMS

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Introduction: Insufficient and disturbed sleep are highly prevalent and associated with adverse consequences in the U.S. military. The purpose of this study was to employ remote monitoring/ecological momentary assessment methods to test the hypothesis that prior-night sleep is associated with next-day subjective symptoms among military personnel.
Methods: Participants (N=270) with sleep problems were recruited from two military treatment facilities and completed an intensive ten-day remote monitoring assessment. Prior night sleep was measured using standardized sleep diaries and a commercial wearable sleep tracker (Fitbit Inspire 2). Next-day symptoms were measured using twice-daily symptom surveys (i.e., 20 surveys over ten days). Individual items assessed subjective cognition, energy level, and mood using an "I feel tired" format and scored from 0-4. To determine the lagged impact of prior-night sleep on next-day symptoms, a total of 40 mixed models (MMs) were developed. Individual prior-night sleep diary (total sleep time [TST], sleep efficiency [SE], and sleep quality [QUAL]) and Fitbit (TST, SE) parameters were entered as independent variables, and individual daytime symptoms (feeling alert, clear-headed, refreshed, fatigued, happy, sad, stressed, and relaxed) were entered as dependent variables. All models controlled for age and sex. The Benjamini-Hochberg procedure for correcting false discovery rate (BH-FDR) method was used to correct for multiple comparisons.
Results: Lagged MM analyses revealed that all prior-night sleep diary variables were significantly associated with next-day symptoms (all ps< 0.001 with df=2081) over ten days. Specifically, prior-night sleep diary parameters (TST, SE, QUAL) were positively associated with next-day feeling alert, clear-headed, refreshed, happy, and relaxed; and negatively associated with next-day feeling fatigued, sad, and stressed. Prior-night Fitbit sleep parameters were significantly associated with most next-day symptoms (largest p=0.023 with df=1956). Specifically, Fitbit TST and SE were positively associated with next-day feeling clear-headed, refreshed, happy, and relaxed and negatively associated with next-day fatigue. Fitbit TST was negatively associated with next-day stress.
Conclusion: Among military personnel with sleep problems, prior-night sleep predicts next-day subjective cognition, energy level, and mood over ten days. Future research should employ remote monitoring approaches to predict treatment response and deliver personalized care to improve sleep and daytime symptoms.
Support (if any): DoD W81XWH1990006 (via Medical Technology Enterprise Consortium)

Abstract citation ID: zsae067.01109

1109

THE IMPACT OF SLEEP DURATION AND ITS VARIABILITY ON THE HUMAN PHENOME: ANALYSIS OF ALL OF US WEARABLES DATA

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Introduction: Epidemiological evidence indicates that short, long and variable sleep duration are associated with cardiometabolic

outcomes. However, due to the ubiquitous role of sleep, one would expect to see effects on a broad range of human diseases. Using electronic health records (EHR) and wearable sleep data from the All of Us Research Program, we conducted a cross-sectional analysis of sleep duration and variability with the risk of over 3530 chronic conditions across the human phenome.
Methods: All of Us participants (≥18 years) with available EHR data and at least 90 days of continuous monitoring using Fitbit devices under a 'bring your own device' model were included. Average (mean) and variability (standard deviation) of sleep duration were derived based on device-generated data. Chronic conditions were determined based on mapping of International Classification of Disease 10 codes available in the EHR to phecodes, an ontology representing clinically meaningful concepts. Associations between sleep traits and phecodes were assessed using multiple test corrected logistic regression adjusted for age, sex, and race.
Results: A total of 8,256 participants with available Fitbit data were included. Participants were 89% White, 72% female, 72% college educated and had median (IQR) age of 51 (36.6-52.0) years, BMI 28.3 (24.4-33.0) kg/m2, and 1,566 (860-2307) days with sleep measurements. The median average nightly sleep duration was 6.34 (5.67-6.91) hours and the median nightly sleep variability was 1.63 (1.33-1.95) hours. In adjusted analyses, participants with greater sleep duration had significantly lower odds of obesity (OR; 95%CI = 0.85; 0.80-0.91, obstructive sleep apnea (0.74; 0.74-0.88), type 2 diabetes (0.68, CI 0.58-0.80), and essential hypertension (0.86; 0.81-0.92). Conversely, participants with greater sleep duration variability had higher odds of major depressive disorder (2.15; 1.84-2.51), anxiety disorder (1.75; 1.51-2.03), gastroesophageal reflux disease (1.61; 1.39-1.86), and abnormal electrocardiogram (1.80; 1.47-2.19).
Conclusion: Our findings suggest important associations between sleep duration patterns and chronic conditions, emphasizing the importance of sleep health in disease prevention and management. Important limitations include analysis of a selected population with access to wearable devices, which may not represent the general population enrolled in All of Us.
Support (if any): All of Us Research Scholars Program

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1110

UTILIZING CONSUMER WEARABLES TO EMPOWER AND ENGAGE PATIENTS PRESCRIBED NON-PAP OBSTRUCTIVE SLEEP APNEA THERAPY

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Introduction: Increased adoption of consumer wearables has resulted in abundant patient-generated health data (PGHD). However, guidance on incorporation of metrics from such devices in the management of sleep disorders is lacking. We aimed to develop a PGHD program, using continuous oxygen saturation (SpO2) monitoring from a consumer wearable as a prototype. By implementing SpO2 data and patient survey outcomes in reports, we engaged patients prescribed non-PAP therapy for obstructive sleep apnea (OSA) and promoted shared decision making to enhance therapy.
Methods: In an ongoing quality improvement project at a VA medical center, we conducted three plan-do-study-act (PDSA) cycles. Patients share SpO2 data collected with a clinic-issued Fitbit via a third-party platform (Fitabase), OSA patient-reported outcome (PRO) measures and their nightly use of non-PAP therapy via Qualtrics. We created a report that juxtaposes SpO2 distribution, PRO measures, and therapy compliance and then send it to the patient for review. At cycle end, patients meet with a sleep clinician to discuss the reports, OSA therapy, and program feedback.
Results: Eleven patients aged 30 to 85 have enrolled (3-5 per cycle). In Cycle 1 (7 days), we developed orientation procedures and patient-facing materials and refined the process for merging the SpO2, PRO, and patient-reported therapy use into a graphical and textual report. A majority of patients (67%, n=6 of 9) indicated motivation to retrial PAP therapy after seeing low SpO2 values. We developed a standardized script to clearly explain the report and data for our patients. In Cycle 2 (14 days), we tested the standardized script and troubleshot barriers to accessing data that emerged— ie unexplained gaps in SpO2 values and device sync issues. In Cycle 3 (28 days), we revised the graphs to reduce production time. Eight patients completed the post program survey. When asked if they would recommend the program (scale 1-10; 10 best), the average score was 9.25.
Conclusion: We developed a consumer wearable based program to engage patients in OSA treatment. Incorporating oxygen data from wearables may promote self-management and participation in shared decision making, which ultimately may improve health outcomes of OSA.
Support (if any): VA Office of Connected Care

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1111

ASSOCIATION BETWEEN TECHNOLOGY USE AND SLEEP: EXAMINATION OF POPULATION DATA FROM NATIONAL SLEEP FOUNDATION

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Introduction: Evening technology use is common and may be associated with poorer sleep health. The purpose of this study was to evaluate rates of technology before bedtime in a national sample and examine the association between technology use and sleep quality and duration.
Methods: We evaluated sleep and technology use among a nationally representative sample of US adults collected by the National Sleep Foundation. Participants reported their use of four classes of technology in the hour before bedtime (i.e., A) TV, smart TV, game consol, B) smartphones, C) computers, laptops, tablets, D) other devices) and where they used these devices (i.e., in the bedroom, outside of the bedroom, both in and outside the bedroom). Participants also reported their average sleep duration over the past week on both weekdays and weekends. Sleep quality was rated on a 5-point scale using a single item from the Sleep Health Index. We used weighted analyses to evaluate descriptives, as well as associations between technology use, location of technology use, and sleep duration and quality using t-tests and regression analysis while controlling for age and gender.
Results: Data were available for 1,009 participants (Mage = 48.2, SD = 18.0, 51.3% women). Results indicated that 90% of

participants used electronic devices within one hour of bedtime, with 76.6% used electronic devices in the bedroom. The most frequently used devices before bed were TVs (71.3% of the sample and among TV watchers 49.7% used in the bedroom) and smartphones (70.6% of the sample and among smartphone users, 79.1% used in the bedroom) Individuals who used smartphones before bed had poorer sleep quality compared to those who did not use a smartphone (t(1007) = -2.19, p = 0.029). There were no other significant associations between number of devices, specific device use, or device use location with sleep duration or quality.

Conclusion: Technology use before bed and in the bedroom is a common occurrence, and smartphone use in the hour before bed was associated with poorer sleep quality. Given the widespread use of smartphones before bed, reducing use in the hour before bed may have implications for improving sleep health.

Support (if any):

Abstract citation ID: zsae067.01112

1112

PERFORMANCE EVALUATION OF A MULTISENSOR RING DURING A CLINICAL MULTIPLE SLEEP LATENCY TEST

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[1] University of Arizona, [2] Happy Ring

Introduction: Commercially-available wearable devices are increasingly used to detect sleep-wake patterns in free-living conditions. These devices, however, are infrequently assessed relative to their ability to detect naps. The present study evaluated whether a commercially-available wearable device was able to detect nap onset during a clinical Multiple Sleep Latency Test (MSLT).

Methods: Participants referred for a clinical MSLT wore a commercially-available multisensor ring device (Happy Ring; Happy Health) during their in-lab assessment at one of two AASM-accredited sleep centers. Each sleep lab followed AASM guidelines for administering the MSLT and scoring the polysomnogram for sleep onset. Due to potential differences in scoring across sites, a third reviewer (INSERT CREDENTIALS HERE) blindly scored all records, also according to AASM guidelines.

Results: Internal sleep lab scoring somewhat differed from the independent scorer, with 90% agreement regarding the proportion of naps that were clinically significant; there were 2 cases where only the sleep lab reported a clinically significant MSLT and 3 cases where only the independent rater reported a clinically significant MSLT. The ring achieved 86% diagnostic accuracy relative to the lab scorer and 84% relative to the independent scorer. The mean difference between the lab and independent scorer for sleep latency was 142 seconds, with N=30 records that achieved agreement of < 150 seconds. Of these 30 records, the Happy Ring achieved 96.7% accuracy (only 1 case of disagreement). The mean difference between the lab scorer and the ring was 152 seconds.

Conclusion: The Happy Ring shows promise in its ability to detect sleep onset during an MSLT. Future work could be used to optimize wearables for being able to predict who will test positive in an MSLT, thus reducing costs, wait times, and patient burden.

Support (if any): Happy Health

Abstract citation ID: zsae067.01113

1113

A PERSONALIZED SMARTPHONE APP IMPROVES SLEEP AND STRESS IN POOR SLEEPERS: A RANDOMIZED WAIT-LIST CONTROLLED TRIAL

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Introduction: Smartphone applications (Apps) offer a highly scalable, engaging, and cost-effective approach to improving sleep-promoting behaviors and attitudes. In this randomized wait-list controlled trial, we evaluated the efficacy of a novel smartphone app, the Dein Schlaf Dein Tag app from SleepScore Labs, designed to objectively measure sleep via PSG-validated sonar methods and improve sleep by providing personalized, dynamic, and evidenced-based sleep and circadian advice and education founded in the principles of sleep hygiene and cognitive-behavioral skills.

Methods: A preliminary analysis of 412 participants with subclinical poor sleep (Regensburg Insomnia Scale score 13-24) randomized to either an App/intervention group (n=128) or a waitlist control group (n=298) was conducted. Changes in subjective sleep quality, perceived stress, and quality of life were measured using validated questionnaires at baseline, 6-weeks, and 12-week time-points. Statistical significance was tested via the interaction of an ANOVA (factor 1: app group vs. waitlist control; factor 2: baseline vs. 6 and 12 weeks).

Results: At both 6 and 12-week follow-up assessments, perceived sleep quality as measured by the sleep quality component of the Schlaffragebogen-B (SF-B) significantly improved among the App/intervention group when compared with controls (12-week effect size 0.646 App vs. 0.250 control group, F: 11.7, p=0.0007). Overall sleep problems as measured by the PSQI also significantly improved at 6 and 12-weeks among the App group when compared with controls (12-week effect size -0.448 app vs. -0.172 control, F: 7.5, p=0.0065). Feelings of being refreshed after sleep significantly improved among the App/intervention group after both 6 and 12-week assessments as measured by the GES component of the SF-B (12-week effect size 0.429 app vs. 0.143 control, F: 5.4, p=0.002). At 12-weeks, perceived stress significantly improved among the App/intervention group as measured using the Perceived Stress Scale (12-week effect size -0.526 app vs. -0.235 control, F: 4.1, p=0.0436), but not at 6-weeks (p=0.08). No significant differences in quality of life as measured using the SF-12 were observed between groups.

Conclusion: This randomized controlled trial demonstrated that a personalized and dynamic sleep improvement and measurement App can improve perceived sleep and stress in individuals with poor sleep.

Support (if any): SleepScore Labs and ResMed Science Center

Abstract citation ID: zsae067.01114

1114

EVIDENCE FOR DEEP SLEEP HOMEOSTASIS IN REAL WORLD SLEEP TRACKING DATA

Balaji Goparaju[1], Matt Bianchi[1]

[1] Apple Inc.

Introduction: Investigations of sleep homeostasis often involve tightly controlled experimental sleep deprivation in service of understanding mechanistic physiology. The extent to which the deep sleep response to recent sleep loss occurs in naturalistic settings remains under-studied. We tested the hypothesis that a homeostatic increase in deep sleep occurs on the first recovery night following occasional short duration nights that arise in naturalistic settings.
Methods: We analyzed sleep staging data in participants who provided informed consent to participate in the Apple Heart and Movement Study and elected to contribute sleep data. The analysis group included n=33,358 participants with at least 30 nights of sleep staging data from Apple Watch.
Results: Short nights of sleep that were >=2 hours shorter than each participant's median sleep duration occurred at least once in 65.1% of the cohort, most often in isolation (< 5% of instances were consecutive short nights). Assessing the amount of deep sleep on the recovery night revealed that deep sleep increased in proportion to the amount of sleep loss on the preceding short night, for short night definitions ranging from 30 minutes to >3 hours below the within-participant median sleep duration. Focusing on short nights that were at least 2 hours below median, we found that 64.9% of participants showed any increase in deep sleep on the recovery nights, with a median increase of 23.9% (absolute increase: median 11 minutes, interquartile range 5 to 19). Among participants with at least three short nights at any time in a 6-month window (28.6%), the percentage of recovery nights having >=5 minutes extra deep sleep showed small but significant Spearman correlations with two measures of sleep consistency, the standard deviation of sleep duration (r = -0.16), and the standard deviation of sleep start time (r = -0.12).
Conclusion: The results provide evidence for homeostatic responses in a naturalistic setting. Although the deep sleep recovery amounts are modest, naturalistic short nights are a lesser perturbation compared to experimental conditions of greater restriction or total deprivation. The findings illustrate the utility of longitudinal sleep tracking to assess real-world correlates of sleep phenomenology established in controlled experimental settings.
Support (if any): n/a

Abstract citation ID: zsae067.01115

1115

NANO-MATERIAL BASED BRAIN COMPUTER INTERFACE (BCI) SLEEP MONITORING DEVICE AND ITS APPLICATION

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[1] Flectothink

Introduction: PSG (Polysomnography) as a traditional instrument for multi-modal monitoring device, has been considered as golden standard for sleep related vital sign monitoring for many decades. But it is sometimes considered burdensome due to its wet EEG electrodes cap, its time-consuming wearing, and it is not suitable for tele-health and at-home monitoring purpose, for chronic disease management especially for elderly senior people.
Methods: Given this, a nano-electronic based sleep monitoring patch device has been developed to overcome these obstacles. The device implements metallic nano-particle electrodes to increase data acquisition efficiency, and well-developed hydrogel to increase skin biocompatibility and gas permeability. Also, the device integrates EEG chip design and three-electrode based setup, to avoid traditional 8-channel or 16-channel EEG headset and dramatically increase the convenience of usage. In terms of software, the device uses artificial intelligence deep learning network to train sleep staging algorithm and implement advanced data processing technology to differentiate EEG, EOG and EMG from the raw data acquired by the device in the forehead.
Results: In this way, the device can also detect characteristic waveform such as slow waveform, kappa complex and spindle etc. All these factors result in 85-95% accuracy of sleep staging percentages, as compared to PSG golden standard, which is dramatic.
Conclusion: The device has passed Class II medical NMPA approval in China and it is getting approval in US FDA very soon. It is believed that this device can be used not only in traditional sleep center and hospital all over the world, but can it also be used in a variety of different departments such as psychiatry, ICU and neurology, as well as rehab centers, nursery, and many other circumstances and locations. It is believed it is beneficial not only for doctors, but for researchers as well.
Support (if any):

Abstract citation ID: zsae067.01116

1116

NATURALISTIC SLEEP TRACKING IN A LONGITUDINAL COHORT: HOW LONG IS LONG ENOUGH?

Balaji Goparaju[1], *Glen DePalma*[1], *Matt Bianchi*[1]
[1] Apple Inc.

Introduction: Objective sleep tracking in health research, often via polysomnography or actigraphy, typically involves a small number of nights per person. Given the nightly variability of sleep duration, it remains unclear the extent to which relatively short observation windows may impact inferences in sleep research.
Methods: We attempt to quantify potential limitations of shorter duration sleep tracking research by sub-sampling from longer-term observation windows using both simulated data from known distributions and real-world Apple Watch sleep tracking data (30-365 nights) from over 35 thousand participants who provided informed consent to participate in the Apple Heart and Movement Study and elected to contribute sleep data to the study.
Results: Simulations demonstrate that the magnitude of deviation from truth defined using all available observations per individual, and the direction of bias depended on the sub-sample size, the type of simulated distribution (gaussian vs skewed), and the summary statistics of interest, such as centrality (mean, median) and dispersion (standard deviation (SD), interquartile range (IQR)). For example, n=7 longitdunal observations from a realistic normal distribution (7 + 1 hours) showed a 6.7% median under-estimation bias (IQR 24% under- to 14.7% over-estimation) compared to the true SD value (1 hour). Real-world sleep duration and sleep stage data, when under-sampled and compared to longer observations within-participant, showed similar SD bias at 7 nights, and similar convergence rates approaching the true value as longitdunal samples increase from 7 to 30 or more nights. Shapiro-Wilk tests for normality and log-normality show that 64% of simulated log-normal (skew) distributions fail to reject normality at n=7 samples, while real-world sleep duration data most commonly failed both normality and log-normality tests even using larger samples (180 nights per participant). Finally, simulating cohorts

with 7 + 1 hours plus a subset of 6 + 1 hours shows that a single-night observation of "short sleep" (6 hours) is more likely from random variation of a 7-hour sleeper than from a 6-hour sleeper. Extending the observation to n=7 nights mitigates this mis-classification risk.
Conclusion: The results suggest that longer duration tracking provides important benefits to reduce bias and uncertainty in sleep health research that historically relies on small observation windows.
Support (if any): n/a

Abstract citation ID: zsae067.01117

1117
ORAL MICROEMULSION GEL SHOWS IMPROVEMENTS IN OBJECTIVE AND PERCEIVED SLEEP

Holly Rus[1], Sharon Danoff-Burg[1], Morgan Weaver[1], Kiara Carmon[1], Catalina Mertz[1], Duvia Lara Ledesma[1]
[1] SleepScore Labs

Introduction: More empirical research is needed on the effectiveness of ingestible consumer sleep products. This study investigated the effects of a gel-delivered sleep supplement on both objectively measured and perceived sleep in a non-clinical sample of adults.
Methods: Healthy adults (58% male, ages 40-73, mean age=56) with difficulty falling asleep or staying asleep participated in a 6-week field study, using a pre-post intervention design. During the 3-week baseline period, participants tracked their sleep at home without intervention. During the 3-week intervention period, 30-minutes before bedtime, participants ingested a gel including a blend of melatonin, L-Theanine, magnesium, calcium, vitamin B6, L-Glycine, 5-HTP, lemon balm extract, and GABA. Sleep was measured objectively using a PSG-validated, non-contact biomotion device, SleepScore Max, every night and by daily and pre-post self-report. Multilevel regression and paired t-tests were used to test for statistical significance.
Results: There were 822 nights of tracked sleep across 26 participants. Compared to baseline sleep, objective sleep measurements showed decreased sleep onset latency (p=.019); increased deep sleep, both in duration (p<.001) and proportion of the night (p=.001); fewer awakenings (p=.003); decreased wake after sleep onset, both in duration (p<.001) and proportion of the night (p=.001); and increased sleep efficiency (p<.001) and sleep maintenance (p=.001). Improvements also were observed in SleepScore (p=.010), a measure of overall sleep quality, and BodyScore (p=.005), a measure of deep sleep. Self-report measures revealed improvements in a variety of outcomes compared to baseline: feeling adequately sleepy during bedtime more nights per week (p=.014); feeling it was easier to fall asleep (p<.033); falling asleep in the preferred amount of time more nights per week (p=.006); feeling better able to sleep through the night without waking (p=.023); perceiving better overall sleep quality (p=.014); feeling satisfied with sleep more days per week (p=.007); and feeling well rested more days per week (p=.048).
Conclusion: In this sample of healthy adults, both objectively measured sleep and self-reported sleep improved when using the gel compared to baseline sleep without intervention.
Support (if any): HealthyCell

Abstract citation ID: zsae067.01118

1118
SMART GOGGLES USED BEFORE BED TO INDUCE RELAXATION IMPROVE OBJECTIVE SLEEP AND REDUCE SELF-REPORTED STRESS

Holly Rus[1], Sharon Danoff-Burg[1], Morgan Weaver[1], Kiara Carmon[1], Catalina Mertz[1], Duvia Lara Ledesma[1]
[1] SleepScore Labs

Introduction: Previous research has shown that gentle, rhythmic vibrations can help induce relaxation and support sleep. This study examined the effects of smart goggles used before bed to deliver gentle vibration and heat to the eyes and temples. Objective sleep, perceived sleep, and self-reported stress, anxiety, and relaxation were measured.
Methods: Healthy adults (40% female; ages 26-75, mean=50) participated in a 6-week field study, using a pre-post intervention design. During the 3-week baseline period, participants tracked their sleep at home. During the 3-week intervention period, participants used Therabody SmartGoggles before bed. The goggles deliver gentle eye and temple massage through vibrating motors and heat for relaxation. Sleep was measured objectively using a PSG-validated non-contact biomotion device, SleepScore Max, every night and by daily, nightly, and pre-post self-report. Relaxation, stress, and anxiety were measured using visual analog scales. Anxiety also was measured with a validated short form of the State-Trait Anxiety Inventory. Multilevel regression and paired t-tests were used to test for statistical significance.
Results: There were over 676 nights of tracked sleep across 20 participants. Objective sleep measurements showed multiple improvements: increased sleep duration (+12 minutes, p=.014); increased deep sleep, in duration (+6 minutes, p=.002), proportion of the night (7% relative increase, p=.020), and BodyScore (4% increase, p=.002); fewer awakenings (7% decrease, p=.021) and decreased wake after sleep onset (-6 minutes, p=.047); and improved SleepScore, a measure of overall sleep quality (3% increase, p=.020). Immediately after using the goggles each night, compared to immediately before using the goggles, participants felt sleepier, less stressed, less anxious, and more relaxed (all ps<.05). At the end of the 3-week intervention period, compared to baseline, participants felt they had better sleep quality; felt more well-rested in the mornings; and showed reduced anxiety, confirming the nightly analysis (all ps<.05).
Conclusion: Objectively measured sleep quality and duration, as well as perceived sleep, improved when using the goggles before bed compared to baseline. Users also experienced increased feelings of relaxation along with reduced stress and anxiety.
Support (if any): Therabody

Abstract citation ID: zsae067.01119

1119
VALIDATION OF A PORTABLE SLEEP ELECTROENCEPHALOGRAPHY DEVICE IN GOOD SLEEPERS AND PEOPLE WITH SLEEP APNEA

Malika Lanthier[1], Micheal-Christopher Foti[2], Caitlin Higginson[3], Paniz Tavakoli[4], Defne Oksit[5], Laura Ray[6], Stuart Fogel[1], Rebecca Robillard[1]

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Introduction: Sleep wearable restricted to accelerometry or heart rate monitoring have proved to be helpful to delineate sleep-wake profiles outside of the laboratory environment, but have limited accuracy and only provide indirect estimations of sleep and wake states. This study aimed to assess the validity of a novel electroencephalography headband for ambulatory sleep monitoring as compared to standard polysomnography in good sleepers and individuals with sleep apnea.
Methods: Forty-seven adult males and females from the community took part to this study. This includes a preliminary sample of eight individuals with sleep apnea detected through level 1 polysomnography. All participants underwent one night of in-laboratory sleep recording with the portable EEG headband (MUSE-S, Interaxon) and simultaneous standard polysomnography (Embla N7000/RemLogic, Natus). The Muse-S headband is a commercially available consumer headband with 7 EEG sensors: 2 on the forehead, 2 behind the ears, and 3 reference sensors. MUSE-S data was scored using an automated sleep staging algorithm. Polysomnography data was scored by an independent registered technologist who was blinded to the MUSE-S algorithm-based scoring.
Results: In the overall sample, the accuracy of the Muse-S relative to standard polysomnography ranged between 88% and 96% across all sleep stages, with a sensitivity of 79% to 92%, and a specificity of 90% to 99%. Cohen's Kappa for all sleep stages combined was 0.76 (CI:0.75-0.76). Analyses per sleep stages showed that Cohen's Kappa scores were in the fair agreement range for NREM 1 sleep (K=0.41, CI:0.39-0.43), increased to the substantial agreement range for both NREM 2 (K=0.75, CI:0.74-0.75) and NREM3 sleep (K=0.77, CI:0.76-0.77), and further increased to the near perfect agreement range for REM sleep (K=0.85, CI:0.85-0.86) and wake (K=0.84, CI: 0.83-0.84). Similar results were obtained in the subgroup with sleep apnea (overall K= 0.87, CI:0.85-0.88; NREM 1 K=0.33, CI:0.28-0.38; NREM 2 K=0.72, CI:0.70-0.73; NREM3 K=0.81, CI:0.79-0.79; REM K=0.80, CI:0.78-0.82) and wake (K=0.86, CI:0.85-0.88).
Conclusion: Portable EEG-based sleep monitoring with the MUSE-S shows good validity for sleep macroarchitecture variables relative to standard polysomnography. Fair to near perfect concordance was observed across sleep stages in a diverse sample of good sleepers and people with sleep disorders.
Support (if any):

Abstract citation ID: zsae067.01120

1120

MEASURING SLEEP DEPTH WITH ODDS RATIO PRODUCT (ORP) AND IN-EAR EEG EARBUDS

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[1] IDUN Technologies AG, [2] Cerebra Medical Ltd.

Introduction: Odds Ratio Product (ORP) is a highly validated measure of sleep depth and sleep-wake continuum derived from 3-second EEG epochs using spectral power analysis of the signal. It has been shown to be more sensitive than traditional sleep metrics to detect sleep quality and there is increasing scientific evidence of the ability of ORP to identify patient subgroups of sleep-wake disorders and guide personalized treatment. In-Ear EEG is an evolving method of measuring brain activity using in-ear electrodes. The current investigation assessed the signal quality of in-ear EEG data obtained from a single-channel in-ear EEG device (IDUN Guardian) alongside the frontal EEG using the Cerebra Prodigy to determine whether ORP calculation has the potential to be translated from frontal EEG to in-ear EEG.
Methods: 18 healthy participants (9 male) were selected ensuring diversity in age (recruited in 24-60 years old range) and sex. Participants wore the Cerebra Prodigy (with forehead electrodes), IDUN Guardian (with in-ear electrodes) while sleeping at home for 3 nights. Data from the devices was collected, synchronized, anonymized, and analyzed to assess the correlation between ORP values derived from the two systems.
Results: Both in-ear and frontal EEG datasets were preprocessed separately (filtered between 0.3 - 40Hz). No artifact rejection was performed. Pearson correlation coefficient of ORP values was calculated between the two systems. An average correlation of 0.35 was found for raw signals based on 3-second epochs where the in-ear EEG seemed to overestimate ORP values. This was improved (r=0.70) by averaging over 10 ORP values (30 second epoch). This is likely due to masking of variability in signals variability in summary statistics.
Conclusion: The results showed that single channel in-ear EEG has the potential to resolve ORP values similar to forehead EEG signals. These results suggest the need for an in-depth analysis of the spectral powers in the different frequency ranges in both systems to guide work on improving alignment between the systems.
Support (if any): This research work was made possible through the Eureka Eurostars program E2634 grant and was financially supported in Switzerland by Innosuisse - Swiss Innovation Agency and in Canada by the National Research Council Canada.

Abstract citation ID: zsae067.01121

1121

MULTI-SENSOR FUSION APPROACH FOR SLEEP STAGE ANALYSIS: A NON-CONTACT SENSOR STUDY

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[1] Samsung electronics, [2] Samsung Medical Center

Introduction: There has been a growing interest in utilizing non-contact sensors such as photoplethysmogram (PPG), ultra-wideband (UWB), millimeter-wave (mmWave) or piezoelectric sensors to measure physiological signals, which are then processed through machine learning for sleep stage analysis. In this study, we conducted an analysis of sleep stages by leveraging data collected from multiple sensors on the subjects and employing machine learning algorithms to combine and interpret the information.
Methods: mmWave and UWB sensors were placed within approximately 500mm around the subject, and Piezo sensors were positioned inside the subject's mattress. Concurrently, physiological signals from those sensors and from polysomnography (PSG) were obtained. . Key indicators for machine learning were extracted from the sensor data collected from each sensor. Convolutional neural network (CNN) and Transformer machine

learning methods were employed to derive sleep stages for each sensor. the sleep stages obtained from each sensor were used as indicators, combined to estimate the final sleep stage. The results were then compared and analyzed against PSG parameters to estimate the accuracy of the algorithm.
Results: A total of 340 participants (244 males, mean age 44.95± 12.40 y) were enrolled in this study. Data from 200 individuals were utilized to train sleep estimation algorithms for each sensor, while data from 110 individuals were employed to train algorithms that combine results from each sensor to determine sleep. Additional 30 datasets were used to validate these algorithms. The sleep stage accuracy (Accuracy = True epoch/ Total epoch) relative to PSG: mmWave (72.9%), UWB (75.5%), and Piezo (72.4%). Cohen's Kappa values were mmWave (0.55), UWB (0.62), and Piezo (0.53). The fusion algorithm based on each sensor demonstrated an accuracy of 79.8% and a Cohen's Kappa value of 0.69 compared to PSG.
Conclusion: In contrast to previous research relying on single-sensor predictions, our approach harnessed the diverse strengths of different sensor types, conducting a comprehensive analysis of sleep stages by combining data collected from multiple sensors.
Support (if any):

Abstract citation ID: zsae067.01122

1122

A DEEP LEARNING MODEL FOR INFERRING SLEEP STAGE FROM A FLEXIBLE WIRELESS DUAL SENSOR WEARABLE SYSTEM WITHOUT EEG

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[1] University of Toronto, [2] Sunnybrook Health Sciences Centre

Introduction: In-lab polysomnography (PSG) is costly and difficult to scale due to a need for specialized personnel for data acquisition and annotation. Numerous novel wearable devices without electroencephalography (EEG) have been developed to improve scalability of data acquisition. However, validated automated approaches to data annotation, including sleep staging are needed. Here, we apply deep learning approaches to the problem of sleep staging using data from the ANNE One (Sibel Health, Evanston, IL), a minimally intrusive flexible wireless dual sensor system measuring chest electrocardiography (ECG), triaxial accelerometry, and temperature, and finger photoplethysmography (PPG).
Methods: We obtained wearable sensor recordings from 281 adults undergoing concurrent clinical polysomnography at a tertiary care sleep lab. PSG recordings were scored according to AASM criteria. PSG and wearable sensor data were automatically aligned using their ECG signals with alignment confirmed by visual inspection. We trained a neural-network model to predict both 3-class (Wake, NREM, REM) and 2-class (Wake, Sleep) sleep stage classifications using a randomly selected 85% of the recordings and tested the model on the remaining recordings. We applied the model to ambulatory wearable sensor recordings from 233 older adults at risk for dementia. Our neural-network employed a convolutional-encoder and autoregressive-decoder architecture. In addition to time domain signals, we also engineered frequency domain features as well as selected scalar and metadata features as input to our model to improve performance. Ensembling of model variants was performed.
Results: Our approach achieved a 2-class macro-F1 of 0.718 with a sensitivity of 0.760 and specificity of 0.763 and a 3-class macro-F1 of 0.585 (wake precision 0.564 accuracy 0.745; NREM precision 0.886 accuracy 0.634; REM precision 0.258 accuracy 0.671). Our feature engineering and training techniques offered a 9% performance improvement from the time domain signals only baseline given the same neural network architecture, while ensembling different model variants offered a further 4% performance improvement.
Conclusion: A deep learning model can infer sleep stage from an EEG-less flexible wireless system and can be successfully applied to data from older community-dwelling adults at high risk for dementia.
Support (if any): The Centre for Aging and Brain Health Innovation, Canadian Institutes of Health Research, National Institute on Aging

Abstract citation ID: zsae067.01123

1123

CIRCADIAN PHASE ASSESSMENTS FROM CLINICAL PATIENTS USING AN AT-HOME SELF-COLLECTION SALIVA KIT

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Introduction: The dim light melatonin onset (DLMO) is the gold-standard for estimating sleep timing and is recognized as a reliable diagnostic tool for circadian rhythm sleep-wake disorders (CRSWD). Its assessment may help optimize treatment of various sleep disorders. The DLMO is usually assessed in a research laboratory or clinic, which presents significant barriers. Thus, there is a need to further evaluate the ecological validity of self-directed collection at home. Salimetrics, Inc. recently introduced a circadian phase assessment kit that allows for self-collection of saliva at home accompanied by laboratory assessed DLMOs. This is a preliminary report of a limited dataset identifying normal (typical) and abnormal (atypical) melatonin profiles.
Methods: Sleep clinic patients (N = 197) utilized one of four different protocols that varied in the number and timing of saliva collection based on their provider's suggestion. Despite different protocols, the actual sampling protocol was performed under the same guidance for all assessments. A typical profile was determined as an expected onset (estimated ~2.5-1.5 hours before bedtime) with a baseline of < 10 pg/ml and a sleep onset of >10 pg/ml. An atypical profile fell outside these parameters. Routine medication usage was also analyzed to determine if there was a correlation between melatonin modulating medications and resulting profiles. Only sex and age were recorded as the participants collected samples as part of the clinical care protocol.
Results: Findings indicate 22% typical profiles vs. 78% atypical profiles. With regards to medication use: 26% of typical profiles vs 19% of atypical profiles had no medications listed, 53% vs 68% used a melatonin modulator, respectively, 14% vs 54% used a psychiatric medication, 21% vs 25% used 2+ psychiatric medications, and 9% vs 14% used a melatonin supplement within 10 days of assessment.
Conclusion: These data corroborate earlier investigations by Burgess and colleagues and suggest that the use of a self-directed, at-home DLMO assessment is feasible and accurate. It further suggests that medication use, or an underlying psychiatric disorder can modulate melatonin secretion exaggerating the CRSWD. Data indicates that this diagnostic tool can accurately

identify many clinical sleep patients with an existing CRSWD or significant sleep wake misalignment.
Support (if any): Salimetrics

Abstract citation ID: zsae067.01124

1124
USE OF SCENTED PILLOW INSERT IMPROVES OBJECTIVE AND PERCEIVED SLEEP OUTCOMES

Sharon Danoff-Burg[1], Holly Rus[1], Morgan Weaver[1], Duvia Lara Ledesma[1], Elie Gottlieb[1], Julia Fox[2], Laura Gibbs[2], Stephanie Anderson[2], Anshul Jain[2], Matthias Tabert[2]
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Introduction: A non-invasive approach to mitigating sleep disturbances is using scents to promote relaxation and sleep. Preliminary mechanistic evidence suggests that olfactory-relevant areas in the brain can influence areas responsible for sleep-wake functioning, and odor can modulate arousal and respiration, indirectly affecting sleep. However, it remains unclear whether preliminary results of in-lab studies generalize to the at-home, naturalistic environment in non-clinical populations. Here, we examined whether a pillow insert embedded with a formulation of fragrance developed for sleep may improve sleep-wake parameters in healthy adults.
Methods: Healthy adults (62% female; ages 20-60, mean=41) participated in a 6-week field study, using a pre-post intervention design. During the 3-week baseline period, participants tracked their sleep at home without intervention. During the 3-week intervention period, following an initial 3-night fragrance familiarization period, participants used a scented pillow insert each week inside their pillowcase. Made from cotton and lyocell fabric, the formulation includes a proprietary blend of fragrance ingredients with notes of lavender, cedarwood, and jasmine. Sleep was measured objectively using a PSG-validated non-contact biomotion device, SleepScore Max, every night and by daily and pre-post self-report. Multilevel regression and paired t-tests were used to test for statistical significance.
Results: There were nearly 600 nights of tracked sleep across 21 participants. Objective sleep measurements showed a reduction in wake after sleep onset (7% decrease, p=.034) and fewer awakenings (9% decrease, p=.045) when compared to baseline sleep. Improvements also were found for self-reported sleep outcomes, including increases in sleepiness at bedtime, perceived sleep quality, and feeling well-rested and refreshed in the morning (all ps<.01). Participants felt satisfied with their sleep 2 more days per week compared to baseline (p<.001).
Conclusion: Among healthy adults, aspects of both objectively measured sleep and self-reported sleep improved when using the scented pillow inserts compared to baseline sleep. These improvements occurred without using invasive or pharmacological interventions, which can be uncomfortable, expensive, and associated with adverse side effects.
Support (if any):

Abstract citation ID: zsae067.01125

1125
USE OF A PILLOW DESIGNED TO HELP USERS FEEL COOL IMPROVES OBJECTIVE SLEEP QUALITY AND PERCEIVED SLEEP

Kiara Carmon[1], Sharon Danoff-Burg[1], Holly Rus[1], Morgan Weaver[1], Devanshi Upadhyaya[1], Duvia Lara Ledesma[1]
[1] SleepScore Labs

Introduction: Comfort and temperature regulation play important roles in sleep quality. This study compared sleep on a pillow designed to help the sleeper feel cool to participants' prior sleep on their original pillow.
Methods: Healthy adults (71% female; ages 24-72, mean age=42) who reported difficulties with sleeping hot or night sweats and frequent awakenings or time spent awake at night, participated in a 9-week field study, using a pre-post intervention design. During the 4-week baseline period, participants used their regular pillow at home. During the 5-week intervention period, following a 1-week adjustment period, participants used Sleepy's SUB-0 Triple Cooling Pillow. The pillow is made with materials designed to help regulate temperature and draw heat away from the body. Sleep was measured objectively using a PSG-validated, non-contact biomotion device, SleepScore Max, every night and by daily and pre-post self-report. Multilevel regression and paired t-tests were used to test for statistical significance.
Results: There were 1,175 nights of tracked sleep across 29 participants. Compared to baseline, objective sleep measurements showed increased REM, indicated by 3 metrics: REM in minutes (9% increase, p=.001), REM as a proportion of the night (13% relative increase, p<.001), and MindScore (4% increase, p=001). There also was improvement in SleepScore, a measure of overall sleep quality (3% increase, p=.005). Self-report measures revealed that the pillow felt cooler and more comfortable compared to the original pillow, and participants perceived that they had less intense night sweats, a reduction in the experience of sleeping hot, and increases in sleep quality, feeling more rested in the morning, and satisfaction with sleep (all ps <.001).
Conclusion: Objectively measured sleep quality and perceived sleep improved when using the cooling pillow compared to the original pillow. Self-report results indicated that the intervention was perceived as comfortable and cool. These perceptions likely are what led to the key sleep improvements.
Support (if any): Mattress Firm INC.

Abstract citation ID: zsae067.01126

1126
IN-PERSON EXPERT MATTRESS MATCHER PROCESS IS ASSOCIATED WITH IMPROVED OBJECTIVE DEEP SLEEP AND PERCEIVED SLEEP

Sharon Danoff-Burg[1], Holly Rus[1], Morgan Weaver[1], Kiara Carmon[1], Catalina Mertz[1], Duvia Lara Ledesma[1]
[1] SleepScore Labs

Introduction: Unsubstantiated claims about the potential benefits of various mattress types can make it challenging for consumers to choose a mattress that fits their personalized needs. Services that provide information and recommendations regarding mattress selection may help solve this problem. However, more evidence and research are necessary to understand such services' potential to support better sleep. This study examined the sleep of research participants using mattresses selected during an in-store matching process compared to using their original mattresses.
Methods: Healthy adults (75% female; ages 27-73, mean=46) participated in a 10-week field study, using a pre-post intervention design. The intervention consisted of being guided in person through the Mattress Firm Mattress Matcher process. During the 4-week baseline period, participants used their regular mattress at home. After being matched at a store near them with a new mattress, participants slept on that mattress for 6

weeks, including a 2-week adjustment period. Sleep was measured objectively using SleepScore Max every night and by daily and pre-post self-report. Multilevel regression and paired t-tests were used to test for statistical significance.
Results: There were over 1,189 nights of tracked sleep across 29 participants. Objective sleep measurements showed that deep sleep improved when using the matched mattress compared to baseline, indicated by 3 metrics: deep sleep in minutes (5% increase, p=.003), deep sleep as a proportion of the night (4% relative increase; p=.030), and BodyScore (1% increase; p=.022). Improvements also were found for a variety of self-reported sleep outcomes, including feeling better able to sleep through the night without tossing and turning, waking up feeling refreshed and well-rested, feeling satisfied with sleep more often, and perceiving better overall sleep quality (all ps<.001). Additionally, compared to baseline, the matched mattress felt more comfortable, pressure relieving, supportive, and cooler (all ps<.001).
Conclusion: Objectively measured deep sleep and numerous aspects of self-reported sleep improved among healthy adults using a mattress selected via an expert, in-person mattress matcher process. The results suggest that this process can support sleep by helping individuals find a mattress that provides an optimal fit for their personal needs.
Support (if any): Mattress Firm INC

Abstract citation ID: zsae067.01127

1127
USE OF AN ADJUSTABLE BED BASE IS ASSOCIATED WITH IMPROVEMENTS IN OBJECTIVE AND PERCEIVED SLEEP

Morgan Weaver[1], Sharon Danoff-Burg[1], Holly Rus[1], Kiara Carmon[1], Catalina Mertz[1], Duvia Lara Ledesma[1]
[1] SleepScore Labs

Introduction: Previous research has shown that comfort of the sleep surface is essential to sleep quality. Additionally, positional adjustment of a sleep surface can help improve sleep and alleviate discomfort. This study compared sleep in an inclined position on an adjustable bed base to participants' prior sleep when sleeping flat in their usual bed environment.
Methods: Healthy adults (71% male; ages 27-75, mean age=44) reporting difficulties with frequent awakenings or time spent awake at night participated in an 8-week field study, using a pre-post intervention design. During the 4-week baseline period, participants slept flat on their regular bed. During the 4-week intervention period, they slept in an inclined position of their choosing using Sleepy's Adjustable Bed Base. Sleep was measured objectively using a PSG-validated, non-contact biomotion device, SleepScore Max, every night and by daily and pre-post self-report. Multilevel regression and paired t-tests were used to test for statistical significance.
Results: There were 951 nights of tracked sleep across 27 participants. Objective sleep measurements showed increased total sleep time (+6 minutes, p=.038) and an increase in light sleep duration (+5 minutes, p=.045) compared to baseline. Also, improvement was observed in BodyScore, an objective measure of deep sleep quality (+2%, p=.030). Self-report measures revealed that using the bed base felt more comfortable compared to sleeping flat using the original bed base (p=.011). Improvements also were found for a variety of perceived sleep outcomes, including the perception of falling asleep more easily, less tossing and turning, better sleep quality, and feeling more well-rested in the morning (all ps<.001).
Conclusion: Several important aspects of objectively measured sleep and self-reported sleep improved when using the adjustable bed base compared to sleeping flat on the original bed base. Additionally, qualitative and quantitative self-report results indicated that the intervention was perceived as comfortable.
Support (if any): Mattress Firm INC.

Abstract citation ID: zsae067.01128

1128
USE OF A RECLINER DESIGNED FOR SLEEP IMPROVES PERCEIVED SLEEP OUTCOMES

Duvia Lara Ledesma[1], Sharon Danoff-Burg[1], Holly Rus[1], Morgan Weaver[1], Kiara Carmon[1], Catalina Mertz[1]
[1] SleepScore Labs

Introduction: The positional adjustment of the sleep surface, such as inclining the upper body and/or legs, can potentially contribute to better sleep and alleviation of discomfort associated with a variety of physical problems. This study compared sleep on a recliner designed for sleep to participants' prior sleep on their original sleeping surface.
Methods: Adults (78% female, ages 29-73, mean age=47) who reported already sleeping at least part of the night on a recliner, chair, or sofa, participated in a 6-week field study, using a pre-post intervention design. During the 3-week baseline period, participants slept at home in their usual environment. During the 3-week intervention period, they slept on the Zecliner at home. This recliner enables users to tailor the sleep surface to their preferences by adjusting the position of the upper body and legs. Sleep was measured objectively using a PSG-validated, non-contact biomotion device, SleepScore Max, every night and by daily and pre-post self-report. Multilevel regression and paired t-tests were used to test for statistical significance.
Results: There were 708 nights of data across 23 participants. While objectively measured sleep did not improve, pre-post analyses revealed increases in self-reported sleep quality (+121%) and feeling well rested in the morning (+119%) compared to baseline (all ps<.001). Satisfaction with sleep and feeling well-rested in the morning increased from 1 to 4 days per week on average (all ps<.001). Also, increases in ratings of comfort (+107%), pressure relief (+240%), sense of weightlessness (+327%), and feeling cool (+180%) were observed compared to baseline (all ps<.001).
Conclusion: Perceived sleep quality at night and feeling well-rested in the morning improved when sleeping on the recliner compared to baseline, likely because the intervention was perceived as more comfortable. Findings highlight the importance of adjustable sleep surfaces in promoting satisfaction with sleep.
Support (if any): Flexsteel

Abstract citation ID: zsae067.01129

1129
EFFECTS OF A MATTRESS PROTECTOR DESIGNED TO HELP SLEEPERS FEEL COOL

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[1] SleepScore Labs

Introduction: Previous research has shown that comfort, including comfort of the sleep surface, is essential to sleep quality. In

addition to comfort, temperature regulation plays an important role in sleep quality. This study compared sleep on a mattress protector designed to help keep the sleeper cool to participants' prior sleep on their original bedding.
Methods: Healthy adults (69% female, ages 21-76; mean age=44) who reported sleeping hot or night sweats, as well as difficulties with frequent awakenings or time spent awake during the night, participated in a 6-week field study, using a pre-post intervention design. During the 3-week baseline period, participants used their regular bedding at home. During the 3-week intervention period, they used Sleepy's Cooling Knit Protector. This mattress protector includes breathable materials designed to draw heat away from the body. Sleep was measured objectively using a PSG-validated, non-contact biomotion device, SleepScore Max, every night and by daily and pre-post self-report. Multilevel regression and paired t-tests were used to test for statistical significance.
Results: There were 973 nights of tracked sleep across 33 participants. Objective sleep measurements showed decreased sleep onset latency (-7 minutes, p=.010) when using the mattress protector compared to baseline. Self-report measures revealed that participants felt cooler and more comfortable, perceived a reduction in sleeping too hot or experiencing night sweats, felt they had better overall sleep quality, and felt more well-rested in the morning (all ps<.05).
Conclusion: Objectively measured sleep onset latency and many aspects of self-reported sleep improved when using the cooling knit protector compared to the original bedding, suggesting that a comfortable and cool sleep surface can lead to improvements in sleep.
Support (if any): Mattress Firm INC

Abstract citation ID: zsae067.01130

1130
USE OF A MATTRESS DESIGNED TO HELP SLEEPERS FEEL COOL IMPROVES OBJECTIVE AND PERCEIVED SLEEP QUALITY

Morgan Weaver[1], Sharon Danoff-Burg[1], Holly Rus[1], Kiara Carmon[1], Catalina Mertz[1], Duvia Lara Ledesma[1]
[1] SleepScore Labs

Introduction: Previous research has shown that comfort, including comfort of the sleep surface, is essential to sleep quality. In addition to comfort, temperature regulation plays an important role in sleep quality. This study compared sleep on a mattress designed to help the sleeper feel cool to participants' prior sleep on their original mattress.
Methods: Healthy adults (72% female; ages 24-73, mean age=42) who reported sleeping hot or night sweats, as well as difficulties with frequent awakenings or time spent awake at night, participated in a 10-week field study, using a pre-post intervention design. During the 4-week baseline period, participants used their regular mattress at home. During the 4-week intervention period, which occurred following a 2-week adjustment period, participants slept on a TEMPUR-LuxeBreeze Medium Hybrid mattress. Sleep was measured objectively using a PSG-validated, non-contact biomotion device, SleepScore Max, every night and by daily and pre-post self-report. Multilevel regression and paired t-tests were used to test for statistical significance.
Results: There were 1,331 nights of tracked sleep across 32 participants. Compared to baseline, objective sleep measurements showed increased time spent in bed (+8 minutes, p=.029) and improved SleepScore, an overall sleep quality metric (+1%, p=.044). Self-report measures revealed improvements in perceived coolness, comfort, support, pressure relief, sleep quality, amount of tossing and turning, satisfaction with sleep, and feeling well-rested in the morning (all ps<.001).
Conclusion: Participants reported a more comfortable sleep, in numerous ways, when using the mattress being tested compared to baseline. In turn, they spent more time in bed, and objective measurements showed improved sleep quality.
Support (if any): Mattress Firm INC.

Abstract citation ID: zsae067.01131

1131
: A NOVEL SENSOR TO TRACK TRANSIENT BLOOD PRESSURE CHANGES DURING SLEEP

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Introduction: Sleep disordered breathing is associated with poor cardiovascular outcomes. However, measurements like blood pressure (BP) using ambulatory BP monitoring (ABPM) are not commonly utilized in sleep assessments because of its difficulty, discomfort, and interference with sleep. ABPM is intermittent and lacks the temporal resolution to identify rapid BP changes. A novel, wearable sensor that captures beat-by-beat BP changes, has been validated against the arterial line. We sought to adapt this device to measure BP changes continuously during sleep.
Methods: We developed a technique that measures transient BP changes during sleep using the novel sensor. The calibration-free technique measures BP changes based on evaluating the sympathetic and vascular tones during steady state breathing and comparing those with that of respiratory events like apneas, hypopneas, and arousals. We developed a machine learning classifier to automatically detect steady state breathing and validated this approach of measuring transient BP changes within twenty-seven patients' arterial line. For each patient, we compared a total of 50 points that were 30 seconds apart exhibiting at least 15 mmHg systolic or 10 mmHg diastolic change for each point.
Results: In twenty-seven patients undergoing surgery, the 50th percentile and 85th percentile of error rate between the arterial line and our approach for estimating BP change was 23.8 and 42, respectively, meeting ISO 81060-3 (< 25% and < 50% error for the 50th and 85th percentiles, respectively). Using our calibration-free technique, we measured transient BP changes induced by sleep events in twenty-eight patients undergoing polysomnography. We observed BP surges in response to events such as EEG arousals (up to 72 mmHg) and obstructive hypopnea events (up to 84.6 mmHg).
Conclusion: This method leveraging a novel, flexible, and sleep-compatible beat-to-beat BP monitoring device accurately and non-invasively tracks transient BP changes during sleep. Applications of this hemodynamic monitoring include the ability to provide stratification of severity of sleep disordered breathing (SDB) events. Additionally, this device can be worn comfortably throughout the night, enabling real-time monitoring of cardiovascular disorders during sleep. Lastly, this device could allow for titration of SDB therapies using real time BP information and objective evaluation of treatment efficacy.
Support (if any):

Abstract citation ID: zsae067.01132

1132

ANALYZING SPECTRAL DENSITY OF EEG DURING SLEEP IN COVID-19 SURVIVORS

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Introduction: - Long COVID19 patients exhibit persistent symptoms, including dyspnea, anxiety, and neurological issues. - Acute COVID-19 infection is linked to neuropsychiatric complications; 62% had cerebrovascular accidents, and 31% had altered mental status. - Depression (33%), anxiety (36%), and insomnia (41%) are common during acute infections, but COVID- 19's impact on sleep architecture is unknown. - Previous study reported EEG changes in COVID19 survivors; alpha intrusion (78%), cyclical alternating pattern (59%), and increased REM density (38%).
Methods: - Sub-analysis of a prospective study with COVID-19 survivors undergoing Level I Polysomnography. - PSG data compared with pre-COVID era healthy volunteers. - EEG analysis was done in MATLAB and included artifact detection, power spectral densities, and REM analysis. - Statistical analysis was done using JASP 0.16.4.
Results: - 132 participants underwent Level I PSG. - Baseline characteristics showed mean age 43.9±14.6 years, mean BMI 24.31±6.54 Kg/m2. - Sleep characteristics: Total sleep time 359.78±70.29 minutes, sleep efficiency 81.53±12.02%, AHI 19.6±18.2. - Spectral wave percentages in REM and NREM sleep varied significantly between COVID and control groups. -Logistic Regression: Factors like age, REM C3 delta, REM C3 theta, NREM C3 alpha, NREM C3 theta, total AHI predict outcome variable (presence in COVID patients). -Multivariate Logistic Regression: Best fit model includes Age, C3 alpha wave percentage of NREM Sleep, and AHI. McFadden R^2 value is 0.56, indicating a good fit; AUC value is 0.94, indicating high predictive ability.
Conclusion: - Significantly high alpha frequency was seen in COVID19 survivors. REM density was also significantly elevated in patients with COVID19. - Presence of these abnormal PSG-EEG waves hints that COVID19 might have similar effects as depression, insomnia on these subjects, at least in the short run. - Whether these changes are temporary or permanent needs to be evaluated by performing serial polysomnography in patients with COVID19 ARDS.
Support (if any):

Abstract citation ID: zsae067.01133

1133

IOT AND SLEEP HEALTH DYNAMICS: EVALUATING POLICY IMPACTS IN THE COVID-19 ERA

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Introduction: The political determination to prioritize public health can significantly influence disease outcomes. In the United States of America, the partisan divide has notably affected the enactment and adherence to public health policies, particularly during the COVID-19 pandemic. This study examines the impact of politically driven public health initiatives on sleep duration in the US population during the COVID-19 pandemic. Leveraging zero-effort technology and IoT device data, the research identifies variations in sleep patterns associated with political climates, providing the intricate relationship between politics and health outcomes during a global health crisis.
Methods: Data from 4,405 households in politically distinct cities within California and Texas are sourced from the ecobee 'Donate Your Data' (DYD) initiative. The dataset was preprocessed for clarity and consistency and stratified into two periods: pre-pandemic (March 2019 to February 2020) and during the pandemic (March 2020 to February 2021). Sleep duration is quantified using motion sensor inactivity as an indicator of rest periods. A Gaussian mixture model is used to identify the sleep cycle clusters, and inferential statistical methods are applied to evaluate the impact of public health policies on sleep duration across different political affiliations.
Results: A significant decrease in average sleep duration was observed post-pandemic onset, from 8.0±3.71 hours to 7.75±3.87 hours. Different sleep patterns were observed between political affiliations, with Democratic regions showing a consistent decline in sleep duration while Republican regions experienced varied changes.
Conclusion: This study highlights how political leanings and consequent health policies significantly impacted sleep health during the COVID-19 pandemic. The integration of IoT data and advanced analytics offers a novel approach to continuously monitor and enhance population health behaviours. The methodologies applied in this approach could inform public health strategies in future emergencies, with political leanings considered as a key factor in sleep health. The findings set a framework for future studies to explore the relationship between political climates and sleep health and to develop demographic- and politics-sensitive predictive tools for sleep health risks. This research supports more robust public health systems capable of sustaining sleep health despite political and societal shifts.
Support (if any):

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1134

POST-ACUTE SEQUELAE SARS COV-2 RELATED SLEEP STUDY AND SYMPTOM-BASED FACTORS ASSOCIATED WITH SLEEP DISTURBANCES

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Introduction: Post-Acute Sequelae of SARS-CoV-2 (PASC) poses a global public health challenge, manifesting in persistent sleep disturbances beyond four weeks post-acute infection Despite the high prevalence of PASC-related sleep symptoms, there is a critical lack of objective evidence, particularly in sleep study characterization and symptom-based PASC contributors to reported sleep disturbances(SD). We sought to identify distinct sleep study features and PASC-related symptoms associated with patient-reported SD.
Methods: This cross-sectional ReCOVER cohort involved patients presenting with PASC from February 2021-May 2023 who underwent sleep studies following a positive COVID test with PROMIS-Sleep Disturbance(PROMIS-SD) collected within 6 months. Sleep study variables (sleep apnea and sleep architectural indices) and PASC-specific symptoms were stratified by PROMIS-SD score. A dichotomized T-score ≥60 defined moderate-severe SD. Multivariable logistic regression models adjusted for age, sex, race, and COVID hospitalization, assessed

the association of sleep study indices and PASC symptom status (never, resolved,recurrent or new) across SD severity group. Statistical interaction of sleep study indices by sex and race were examined.

Results: The sample included 494 patients(age:49.5±12 years,BMI:35±9 kg/m²,73.1% female,82.5% vaccinated). Of 365 patients completing PROMIS-SD,166(45.5%) reported moderate/severe SD. Of all sleep study indices examined, only lower REM % was associated with higher SD, OR=0.95, 95% CI=0.92-0.99, p=0.01. Notably, males and black patients with moderate-severe SD exhibited higher average heart rate during sleep(statistical interaction p-values=0.01). Recurrent PASC symptoms were more common in moderate to severe vs normal/mild SD respectively: dyspnea(75.2 vs 60.9%,p=0.008),-joint aches/pains(47.7 vs 31.1%,p=0.04) and headaches(47.7 vs 33.1%,p=0.03).

Conclusion: The sleep architectural alteration of lower percentage of REM sleep is associated with greater degree or patient-reported sleep disruption in PASC. Males and black individuals experiencing moderate-severe SD showed elevated heart rate during sleep, potentially reflecting sleep-related autonomic dysfunction in PASC. PASC-specific symptoms of dyspnea,joint pain and headaches appear to be clinically relevant sleep disruptors in recurrent PASC. Future investigation should focus on enhanced understanding of REM sleep-specific neural circuitry and memory consolidation in PASC as well as sleep-related autonomic fluctuations in predisposed subgroups. Moreover, targeting treatment of specific PASC symptoms such as dyspnea and pain may mitigate compromise in sleep and improve clinical outcomes.

Support (if any):

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1135

PREDICTORS OF POST-COVID CLINICAL AND COGNITIVE CONSEQUENCES

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Introduction: "Post-acute sequelae of SARS-COV-2 infection (PASC)" is a condition with a wide range of physical and mental health consequences that are present or persist four or more weeks after SARS-COV-2 infection. Fatigue is one of the most common PASC symptoms. It is not known whether underlying OSA and sleep disturbances may influence the persistence of chronic physical, mental health and neurocognitive dysfunction post-COVID. This pilot study will systematically examine whether sleep disturbances and severity of OSA comprise modifiable facets of PASC.

Methods: We prospectively collected sleep quality, sleepiness, quality of life (QoL) and neurocognitive data in patients with post-COVID fatigue (PASC) and OSA, and compared with control patients with OSA but without prior COVID infection. Questionnaires were administered at baseline and after 3 months to evaluate sleep disturbances, sleepiness, and general and disease specific QoL. Cognitive testing included Trail Making Test Part A and B, Paced Auditory Serial Addition Test (PASAT), Stroop Task, Digit Coding, Hopkins Verbal Learning Test-R (HVLT-R), Weschler Abbreviated Scale Intelligence II (WASI), Weschler Memory Scale IV (WSM), and Psychomotor Vigilance Test (PVT), respectively. 6-minute walk test and COVID-infection related medical data were also collected.

Results: Thus far, we have enrolled 26 total participants, 16 controls (13 males, 3 females; age: 65.4±11.7 years, BMI: 35.4±12.8 kg/m2, AHI: 49.2±34.6/hr, Education:14.4±3.0 years), and10 patients with PASC (7 males, 3 females; age: 59.3±12.8 years, BMI: 31.7±8.4 kg/m2, AHI: 44.2±33.6/hr, Education:16±2.3 years).Baseline data in controls vs. PASC patients are given as: FSS Total Score: 29.8±16.7 vs. 37.9±11.2, ESS: 8.6±4.7 vs. 8.5±5.6, PROMISE Sleep Disturbance Score: 20.2±10.1 vs. 22.9±11.2, 6-Minute Walk Test Total Distance Walked: 415.5±56.8 vs. 389.1±47.2 meters, FOSQ Total Score: 16.7±3.9 vs. 17.17±3.2, HVLTR Total Recall: 88.2±14.5 vs. 83.2±16.2, WMSIV Visual Reproduction Delayed Recall: 109.2±19.8 vs. 106.2±27.7, TMT-B: 94.2±21.1 vs. 93.0±25.6, Stroop Color-Word Score: 88.7±10.7 vs. 94.5±20.1, WASI-II FISQ4 Score: 97.6±11.2 vs. 96.2±17.2, PASAT Rate 2 Correct: 38.8±25.4% vs. 33.3±33.3%, PVT Mean Reaction Time: 319.2±65.2 vs. 324.7±149.5 ms.

Conclusion: Our study provides preliminary data on important clinical metrics in patients with post-COVID sequelae. Additional data will allow us to determine future targets for management of PASC.

Support (if any): VHA RR&D # RX004396 (SPiRE)

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1136

SLEEP DISORDERS IN CHILDREN AND ADOLESCENTS WITH LONG COVID

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Introduction: Recognition of Long COVID is increasing and sleep disturbances are common to this population. This study describes sleep disorders and associated comorbidities in youth with Long COVID.

Methods: This is a retrospective cross-sectional study of patients initially presenting to the Long COVID clinic. We examined the prevalence of sleep disturbances (SD) and compared those with and without SD in comorbidity and symptomatology. Single-factor regression analyses were used to explore the relationship between SD and patient well-being. Multi-factor regressions analyses with PROMIS SD score as the predictor and age as a continuous covariate were analyzed for the several response variables: child well-being, general fatigue, sleep/rest fatigue, cognitive-fatigue, total fatigue, anxiety, and depression scores.

Results: Of 250 patients: age ranged 3-24 years(mean 14.6± 3.4years), predominantly female(157/250;63%), white(202/81%);and non-Hispanic(204/250;82%). Patients with SD made up 26%(64/250): 28% circadian rhythm disorders, 31% insomnia, and 1.2% hypersomnia. Compared to the non-SD group, the SD group was more likely to report comorbidities: abdominal pain(52% vs37%, p=0.035), nausea(64% vs52% p=0.084), constipation(50% vs26% p< 0.001), anxiety(89% vs53% p< 0.001), depression (48% vs27% p=0.002), ADHD(27%

vs27% p=0.008), headaches(88% vs67%, p=0.002), dizziness (83% vs52%, p< 0.001), POTS(28% vs16%, p=0.027), brain fog(47% vs29%, p=0.009), fatigue (95% vs77%, p=0.001), appetite loss(47% vs29%, p=0.007), and fever(47% vs72%, p=0.053). Using regression analyses, higher PROMIS SD scores negatively associated with child well-being scores (β2= -0.71±0.2; F2, 63=6.37, P< 0.001, R2=0.17), sleep/rest fatigue(β2=-0.51±0.26; F2, 63=5.81, P=0.004, R2=0.16), and total fatigue(β2=-0.65 ±0.2; F2, 63=8.05, P< 0.001, R2=0.20). No significant relationships were found with general/cognitive fatigue scores. Positive correlations found between PROMIS SD scores and anxiety and depression t-scores(β2= 0.26±0.10; F2, 63=3.08, P=0.05, R2=0.09; and β2=0.30±0.11; F2, 65=3.74, P=0.03, R2=0.11, respectively).

Conclusion: Sleep disorders are prevalent among youth with long-COVID, often coexisting with higher rates of physical, neurological, and psychological symptoms. Higher PROMIS SD scores predict lower child well-being, and higher mood disorder scores. While other factors likely impact long-COVID outcomes, sleep plays an integral role. These findings suggest that SD is a key factor in the overall health and mood of children with Long-COVID, emphasizing the need for integrated care approaches that address both sleep and psychological health.

Support (if any):

Abstract citation ID: zsae067.01137

1137

SLEEP QUALITY OF UNDERGRADUATE MEDICAL STUDENTS DURING AND POST LOCKDOWN: A CROSS SECTIONAL STUDY

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Introduction: The global upheaval caused by the COVID-19 pandemic significantly influenced healthcare and medical education. Faced with in-person learning restrictions, institutions globally adopted online platforms, disrupting the daily routines and sleep patterns of medical students. This study aims on the assessment of sleep quality among undergraduate medical students affiliated with the National Medical Council in India, exploring effects of COVID-19 lockdown measures on their sleep patterns both in the short and long term.

Methods: Conducting a cross-sectional survey, participants included undergraduate medical students from NMC-registered colleges, encompassing all genders. Ethical approval and written consent were obtained, employing respondent-driven sampling to recruit 165 participants over six months (October 2021 to March 2022). The study utilized the Pittsburgh Sleep Quality Index (PSQI), a validated questionnaire with 19 self-rated questions and five partner-rated items, if available. Statistical analysis involved SPSSv2021 for descriptive analysis, PSQI score calculations, and tests examining associations between PSQI components and sociodemographic variables.

Results: Among the 171 participants, 9.4% reported poor sleep quality during the lockdown, decreasing to 4.7% post-lockdown—a substantial 50% improvement. Noteworthy changes were observed in specific PSQI components, such as sleep quality and habitual sleep efficiency, with sleep duration decreasing by 23.4% during lockdown and increasing by 45.6% post-lockdown. Weak correlations between PSQI scores during and post-lockdown suggested persistent sleep challenges for those initially affected. Sociodemographic factors showed no significant associations with PSQI score changes.

Conclusion: This study accentuates the pandemic's impact on the sleep quality of undergraduate medical students, revealing a significant 50% enhancement post-lockdown. It underscores the importance of addressing reduced sleep quality among this demographic and emphasizes the need for strategies promoting good sleep hygiene and offline study habits. Future research should delve into the academic consequences of poor sleep during the pandemic and assess students' readiness to seek advice or treatment for sleep-related issues. In summary, the study highlights the critical significance of sleep quality among undergraduate medical students and underscores the imperative for interventions supporting their well-being amid and beyond the COVID-19 pandemic.

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1138

THE ASSOCIATION BETWEEN RACIAL DISCRIMINATION DURING COVID-19 AND SLEEP QUALITY AMONG ASIAN AMERICANS

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Introduction: The positive association between racial/ethnic discrimination and poor sleep health has been well documented among racial/ethnic minoritized populations in the US. Although Asian Americans experienced a rise in anti-Asian discrimination during the COVID-19 pandemic, they remain underrepresented in sleep studies. Studies suggest that the positive association between discrimination and poor health outcomes is stronger with increased levels of acculturation among Asian Americans, however, this modifying effect has not been tested in sleep studies. Our aims were to examine the association between racial discrimination experienced during COVID-19 (COVID discrimination) and poor sleep quality(SQ) and test differences in this association by English proficiency, a proxy for acculturation, among a sample of Asian Americans.

Methods: Using survey data from a sample of Korean American adults living in the Southeastern US (n=360), we conducted logistic regression analyses to test the association between COVID discrimination and poor SQ. We progressively adjusted for age, gender, education, nativity status, and English proficiency. We conducted moderation analyses (COVID discrimination*English proficiency) in fully adjusted models. COVID discrimination was assessed using a count of discriminatory experiences reported during the COVID-19 pandemic. Self-reported English proficiency was dichotomized into high and low proficiency. Poor SQ was determined using Pittsburgh Sleep Quality Index scores >5.

Results: Most participants were immigrants (98.61%) and highly educated (79.17%). About half of the sample identified as women (49.33%) and had high English proficiency (55.28%). Mage=40.67 years (SD=12.18). On average, participants reported < 1 experience of COVID discrimination and the majority reported good SQ (68.33%). Every additional COVID discrimination experience was associated with 33% increased odds of poor SQ (OR=1.33, 95%CI: 1.10-1.61, p< 0.001) in fully adjusted models. English language fluency did not moderate this association.

Conclusion: Although the height of COVID-19 pandemic has subsided, these findings shed significant light on the persistent impact of racial discrimination, specifically its adverse effects on the sleep quality of Asian Americans. There is urgent need to advocate for a proactive approach in tackling anti-Asian discrimination. If replicated through larger-scale studies, the findings may suggest that addressing anti-Asian discrimination is essential to supporting good sleep quality among members of the Asian American community.
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1139
THE ASSOCIATION BETWEEN SLEEP AND CORONAVIRUS DISEASE-19 SEVERITY

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Introduction: Sleep disturbances are key symptoms of long-COVID syndrome, particularly in patients with severe COVID-19. It is therefore critical to understand the sleep characteristics and the association between sleep and COVID-19 severity in patients diagnosed with COVID-19. The study's purpose is to investigate 1) self-reported sleep characteristics in patients diagnosed with COVID-19 and 2) the association between sleep characteristics and COVID-19 severity after controlling for depressive symptoms and age.
Methods: In this correlational and cross-sectional study, data were collected via an online survey posted on social media. The sample included 90 patients diagnosed with COVID-19 (female: 47.8%; mean age= 36.6 ± 10.1 years). The survey was completed by participants 308.95 ± 164.7 days after their COVID-19 infection. Self-reported sleep characteristics were measured by the Pittsburgh Sleep Quality Index (PSQI) and the Epworth Sleepiness Scale (ESS). COVID-19 severity was measured by hospitalization, use of oxygen therapy, and use of ventilation. Depressive symptoms were measured by the Patient Health Questionnaire (PHQ-9). Descriptive statistics and multiple regression were used to analyze the data.
Results: A total of 66.7% were hospitalized; 57.8% used oxygen therapy, and 66.7% used ventilation. In all, 6.7% and 4.4% had sleep time < 6 hours and > 9 hours, respectively; 17.8% had sleep efficiency < 85%; 54.4% had poor sleep quality (total score of PSQI > 5); and 38.9% had excessive daytime sleepiness (total score of ESS >10). After controlling for depressive symptoms and age, COVID-19 severity (i.e., hospitalization, use of oxygen therapy, and use of ventilation) significantly predicted self-reported sleep time [$F(5, 84)= 4.16$, $p= 0.002$, $\Delta R2= 0.1$], self-reported sleep efficiency [$F(5, 84)= 2.5$, $p= 0.037$, $\Delta R2= 0.09$], sleep quality [$F(5, 84)= 9.23$, $p < 0.001$, $\Delta R2= 0.04$], and daytime sleepiness [$F(5, 84)= 14.41$, $p < 0.001$, $\Delta R2= 0.03$].
Conclusion: Poor sleep quality and excessive daytime sleepiness are common in patients diagnosed with COVID-19. COVID-19 severity was significantly associated with self-reported sleep characteristics, but the effect size is small. A further understanding of sleep problems and the relationship between COVID-19 severity and sleep in patients diagnosed with COVID-19 is required to design interventions to improve sleep.
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1140
THE INFLUENCE OF DAILY REST AND ACTIVITY ON MENTAL HEALTH AMONG JAPANESE ADULTS DURING THE COVID-19 PANDEMIC

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Introduction: The global COVID-19 pandemic has not only presented an unprecedented threat to physical health but has also cast a shadow over the mental well-being of individuals worldwide. Various sleep disturbance symptoms have been reported, including a sense of nonrestorative sleep and poor sleep quality. Promoting the mental health of community residents is critical in their lives. This study examined the relationship between sleep habits, activities of daily living, and mental health symptoms in young to middle-aged Japanese adults.
Methods: The participants were 76 adults not currently attending a psychiatric clinic. Participants kept a sleep diary for at least five days (including two days off), recorded daily activity using Fitbit Sense, and answered questionnaires regarding psychiatric symptoms and sleep. The Patient Health Questionnaire-9 (PHQ-9), State-Trait Anxiety Inventory-S (STAI-S), Beck Depression Inventory (BDI), and Temperament and Character Inventory Harm Avoidance (HA) were used to assess psychiatric symptoms. The Insomnia Severity Index (ISI), Hyperarousal Scale, Pittsburgh Sleep Quality Index (PSQI), and Epworth Sleepiness Scale (ESS) were used to assess subjective symptoms. Sleep diary records were averaged over five days and rated for bedtime, waking time, time in bed, sleep duration, sleep satisfaction, and sleepiness upon awakening. The study was approved by the Bioethics Review Committee of Nagoya University School of Medicine.
Results: Daily wakefulness, sleepiness, and subjective sleep efficiency were significantly related to psychiatric symptoms such as PHQ-9, STAI-S, BDI, and HA (Fatigability). Participants with a higher total HA score and HA (Fatigability) score had a significantly lower amount of active time in their daily lives, as recorded by Fitbit.
Conclusion: Daily rest and activity levels have an impact on mental health during the COVID-19 pandemic in Japanese community residents.
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1141

LONG-TERM EFFICACY OF ACETAZOLAMIDE IN TREATING CENTRAL SLEEP APNEA AFTER TRAUMATIC BRAIN INJURY

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Introduction: Central sleep apnea (CSA) is characterized by recurrent cessation of breathing during sleep due to a failure of the physiological mechanisms responsible for the respiratory drive. Risk factors include congestive heart failure, high altitude, opioids, and traumatic brain injury (TBI), particularly brainstem injury. Current mainstay treatments are positive airway pressure (PAP) and oxygen therapy. Medications such as acetazolamide are presumed to enhance respiratory drive or modulate chemosensitivity. Given the high degree of nonadherence to PAP therapy, medications are an appealing alternative treatment for CSA.
Report of case(s): A non-verbal 39-year-old man with spastic quadriplegia, intractable epilepsy, and static encephalopathy secondary to a TBI from a motor vehicle accident at age 10 was evaluated in the sleep clinic due to his caregiver's concern for loud snoring, witnessed apneas, and daytime hypersomnolence. The caregiver denied the use of opioids, sleep aids or a history of parasomnias. Overnight home oximetry results demonstrated nocturnal hypoxemia with a SpO2 nadir of 71%. The initial in-laboratory polysomnography showed an apnea-hypopnea index (AHI) of 144.2 with a central apnea index (CAI) of 131.6 and no Cheyne-Stokes respiration. A subsequent in-laboratory PAP titration was difficult due to the patient's inability to follow commands. He was then started on treatment with auto-titrating CPAP 5-10 cmH2O with a full facemask. However, the therapy was ineffective due to the patient chewing on several different masks, so he was transitioned to supplemental oxygen therapy. Due to the potential choking hazard, other options such as tracheostomy and medications were considered. Because a tracheostomy would only address the obstructive component of his sleep apnea, the patient was started on acetazolamide 250 mg per G-tube daily. Reevaluation at two months with a repeat in-laboratory polysomnography demonstrated complete resolution of sleep-related respiratory events with an AHI of 0.0 and the caregiver reported improvement in daytime hypersomnolence. Repeat polysomnography 9 months later showed continued efficacy of the therapy with an AHI of 1.7 and CAI of 0.0.
Conclusion: Current literature demonstrates improvement of CSA with short-term use of acetazolamide. This case highlights the potential long-term efficacy of acetazolamide for chronic management of CSA in patients with TBI.
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1142

ATYPICAL CATAPLEXY AND POST LP HEADACHES IN POTS WITH FEATURES OF NARCOLEPSY TYPE I

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Introduction: Postural Orthostatic Tachycardia Syndrome (POTS) consists of orthostatic intolerance upon standing resulting in lightheadedness or fainting. Narcolepsy type I (Narcolepsy with cataplexy) is a disorder of hypersomnolence categorized by cataplexy and impaired hypocretin levels in the hypothalamus. The diagnostic criteria for type 1 narcolepsy include the presence of cataplexy or cerebrospinal fluid orexin-A/hypocretin-1 ≤ 110 pg/mL. Recent data reveals the increased prevalence of POTS in narcolepsy, particularly NT1 phenotype. We present two patients with POTS and features of cataplexy with a normal orexin level.
Report of case(s): Patient 1: A 19-y/o Caucasian female presented with excessive daytime sleepiness with the onset of symptoms occurring 5 years before her initial evaluation. The patient describes episodes of "feeling weak" and experiencing symptoms of lightheadedness when "laughing a lot." A lumber puncture (LP) was conducted by an experienced neurologist using a 22G spinal needle drawing 15cc of CSF The patient described severe headaches lasting for 4 days following the LP, which improved with caffeine, hydration, and analgesics. CSF Orexin= 248 pg/mL. Patient 2: A 22 y/o female presented with severe fatigue, EDS, and POTS against a history of Ehlers-Danlos Syndrome despite a total sleep time of 7-8 hours per night. The patient noted a "loss of coordination" and "sudden muscle weakness when she felt excited and upset while standing, Due to the presence of serotonergic agents and suicidality, a CSF orexin level was drawn using a 24G spinal needle drawing 15cc of CSF. The patient also described severe headaches lasting for a week following the LP, which improved with a blood patch. CSF Orexin= 281 pg/mL.
Conclusion: Our experience illustrates two important findings about patients with POTS who presented for narcolepsy evaluation: (1) reports of atypical cataplexy may be related to autonomic intolerance compared to cataplexy triggers and is positional in nature, and (2) The prevalence of post-LP headaches in POTS might require prophylactic blood patch and conservative measure to prevent CSF leak/spontaneous intracranial hypotension.
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1143

NUCLEAR NARCOLEPSY

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Introduction: The sleep -wake mechanism is a complex network of structures of the brain and numerous neurotransmitters. Notably, the hypothalamus produces a powerful wake promoting peptide, orexin, which lack thereof results in narcolepsy. Moreover, studies have demonstrated that the thalamus,although not fully elucidated, plays a dichotomous role in the sleep -wake cycle. This case highlights an interesting iatrogenic cause of hypersomnia.
Report of case(s): Patient is a 49 year old male who presents for evaluation of hypersomnia. He had some sleepiness throughout his adult life but worsened significantly in the recent years prior to presentation. His Epworth Sleepiness Scale is 21. No hypnagogic/hypnopompic hallucinations, cataplexy, sleep attacks, sleep paralysis reported. Mild snoring is present. His BMI is 24kg/m2. His PMH is notable for essential tremor treated with stereotactic radiosurgery thalamotomy four years prior to presentation. He underwent polysomnography that was overall unremarkable with no evidence of sleep disordered breathing or periodic limb movements, but the study had sleep onset REM of 13 minutes. The following day, an MSLT was performed and demonstrated

sleep latency of 3 minutes and 26 seconds and one sleep onset REM. He was diagnosed with secondary narcolepsy and started on pharmacotherapy with modafinil.
Conclusion: The patient in this case underwent stereotactic radiosurgery to the thalamus for treatment of essential tremor. Given the proximity of the thalamus to the hypothalamus, it is thought that damage to this structure resulted in loss of orexin causing secondary narcolepsy. Furthermore, excessive daytime sleepiness is a consequence of thalamic lesions such as thalamic stroke further demonstrating the role of the thalamus in the sleep -wake mechanism.
Support (if any): Cai H, Wang XP, Yang GY. Sleep Disorders in Stroke: An Update on Management. Aging Dis. 2021 Apr 1;12(2):570-585. doi: 10.14336/AD.2020.0707. PMID: 33815883; PMCID: PMC7990374. Cheng P, Roehrs T, Roth T. Daytime Sleepiness and Alertness. Principles and Practice of Sleep Medicine. 7th Edition. Elsevier. 2022. Chapter 4, 35-45.e5.

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1144
UNIQUE USE OF PAP DOWNLOAD DATA TO IDENTIFY NON-24-HOUR SLEEP-WAKE RHYTHM DISORDER (N24SWD) IN SIGHTED INDIVIDUAL

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Introduction: N24SWD is a circadian rhythm sleep disorder (CRSD) in which there is misalignment between the 24-hour light dark cycle and the non-entrained endogenous circadian rhythm of sleep wake propensity. We present case of a sighted individual, incidentally noted to have FN24SWD upon review of his PAP download data.
Report of case(s): A 75-year-old sighted, single male with major depressive disorder (MDD), generalized anxiety disorder (GAD), obstructive sleep apnea (OSA), restless leg syndrome (RLS), insomnia and hypertension presented to sleep clinic. Patient after retirement spent most of his time working on small engineering projects and programming. He reported regular use of PAP with average daily use of 7 hours and 11 minutes. PAP data review revealed well controlled OSA with residual apnea-hypopnea index of 3.1/ hour. His time in bed delayed approximately 1 to 2 hours each night and would cycle around every 20 days with 1 to 2 days in a month without any sleep. His Epworth Sleepiness Scale score was 3/24. Medications included gabapentin and ropinirole for RLS, trazodone, melatonin for insomnia, buspirone, citalopram. Based on the patient's history, corroborated by PAP device data, diagnosis of behaviorally induced Non24SWD was made. Patient reported intermittent insomnia managed by above stated medications and thus reported no impact on his social life. Thus, he deferred treatment to entrain the rhythm.
Conclusion: Treatment for CSRDs comprises of melatonin in sighted individuals and melatonin receptor agonists in blind. In our patient, melatonin was used ad lib as a sleep promoting agent. Lack of regular daytime bright light exposure and light exposure from screens at night contributed to lack of entrainment . It is usually noted in blind individuals due to lack of photic input to circadian pacemaker. In sighted individuals, delayed sleep phase, decrease light exposure, psychiatric disorders, TBI or dementia is noted. In our case anxiety and depression were noted. This case highlights the unexpected discovery of Non 24SWD on detailed review of PAP download data in case of good PAP adherence, essentially replacing actigraphy. Thus, in CPAP compliant patient, detailed PAP review can help identify circadian disorders especially where actigraphy may be difficult to obtain.
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1145
STRIDE ALONG WITH STRIDOR IN THE SETTING OF CSA: AN UNUSUAL PRESENTATION OF PEDIATRIC CERVICOMEDULLARY GANGLIOMA

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Introduction: We describe an unusual presentation of a cervicomedullary ganglioglioma secondary to findings of stridor despite positive airway pressure (PAP) therapy and the presence of treatment emergent central sleep apnea in a pediatric patient.
Report of case(s): Patient is an 8 year old male with a history of congenital subglottic stenosis and no history of neurologic problems who presented to the sleep clinic for stridor despite adequate adherence to CPAP. Split night polysomnogram (PSG) showed moderate OSA (OHI 8.3/h) and treatment emergent central sleep apnea. Patient was unable to tolerate BPAP ST and wanted to go back to CPAP. Drug induced sleep endoscopy findings were significant for mild collapse of upper airway with no snoring. Repeat PSG - 6 months later - was significant for severe obstructive and central sleep apnea (OAHI 10.4, CAI 19, REM CAI 54, AHI of 30). MRI of the brain showed cervicomedullary tumor with marked effacement of the foramen magnum. Further workup showed right vocal cord paralysis. Biopsy confirmed ganglioglioma. Tumor was not amenable for surgical resection hence proton radiation therapy was pursued. Repeat titration study was performed which showed BPAP ST settings of 12/6 with BUR of 12 to be effective with residual AHI of 0.7. Patient developed radiation induced tumor psuedoprogression and tumor necrosis with worsening ataxia and recurrence of central and mixed apneas requiring AVAPS for further respiratory support due to progressive neuromuscular weakness. Stridor resolved after AVAPS support.
Conclusion: Stidor in a pediatric patient can involve various anatomical abnormalities of the upper airway. However, in the setting of central sleep apnea, abnormalities of the brain stem can lead to stridor. We present a patient with a prolonged period of central sleep apnea of unknown etiology and persistent stridor despite adequate adherence to PAP therapy that ultimately led to a diagnosis of a cervicomedullary ganglioma before neurologic symptoms developed.
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1146
POLYSOMNOGRAPHIC DESCRIPTION OF HEMIFACIAL SPASM

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Introduction: Hemifacial spasm is characterized by sudden, involuntary, irregular, tonic or clonic motor discharge of the

facial nerve (seventh cranial nerve), leading to muscular contraction. Its etiology may be idiopathic or secondary to an irritation of the facial nerve. Possible sources of irritation include vascular malformations, infections, trauma, and tumors. Hemifacial spasms may be a temporary or a permanent sequela from Bell's palsy. This disorder typically presents unilaterally, although it may be seen bilaterally in about 5% of the cases. This condition affects women more often than men in a 2:1 ratio. To this day, there is minimal information describing hemifacial spasms during sleep using a polysomnogram (Incirli et al. 2019, Montagna et al. 1986 article). The previous studies documented the persistence of hemifacial spasms in sleep but did not offer illustrative polysomnographic images. In this case report, we illustrate the polysomnographic characteristics of hemifacial spasms in order to improve a sleep medicine provider's ability to identify and recognize these events.

Report of case(s): We are able to provide polysomnographic images demonstrating both sustained and intermittent paroxysmal left-sided facial muscle activity in the left mastoid, left EOG, as well as left central and left frontal EEG leads. The occipital EEG leads bilaterally did not demonstrate this finding. Chin EMG also revealed this activity. The muscle activity was most notable during wake but persisted during both NREM and REM sleep (Images will be provided in the poster).

Conclusion: We were able to document paroxysmal left-sided facial muscle activity during wake and sleep in a patient who carries a diagnosis of left hemifacial spasm. This description can be used as a visual reference for sleep medicine providers when encountering this unusual polysomnographic appearance.

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1147

SLEEP ENIGMAS IN PRIMARY CILIARY DYSKINESIA: AN ATYPICAL CASE OF SLEEP MOVEMENT DISORDERS AND ALPHA-DELTA SLEEP

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Introduction: Sleep disorders are characterized by the impairment of the quality, timing, and amount of sleep, which results in daytime distress and functioning. Primary Ciliary Dyskinesia (PCD) is a rare genetic condition with oto-sino-pulmonary complications associated with various comorbidities, including sleep-related disorders. However, sleep-related research and its implications in PCD are substantially limited.

Report of case(s): A 40-year-old Puerto Rican female with a history of RSPH4A [c.921 + 3_921 + 6delAAGT] PCD founder mutation was evaluated for sleeping difficulties. Upon taking history, the patient mentioned that she has been struggling with getting adequate sleep, where she complains of difficulty falling asleep, occasional snoring, and unexplained movements while sleeping. Physical examination presented with Mallampati (4+) but did not show significant neck circumference enlargement, body-mass index, or other neurologic deficits. Diagnostic polysomnogram did not show obstructive sleep apnea (OSA), with a baseline Apnea-Hypopnea Index (AHI) of 1.3/hr. The patient had a prolonged wake after sleep onset (WASO) period, resulting in poor sleep efficiency. The EEG showed alpha delta sleep. Moreover, Periodic Limb Movements in Sleep (PLMS) were present with important sleep fragmentation during the first half of the study (Periodic Limb Movement Index of 15.9/hr); eventually improving when the patient was able to consolidate sleep. Other movements during sleep/drowsiness were appreciated, with large amplitude and rhythmic artifacts in the EEG and legs EMG channels. These movements are most consistent with Rhythmic Movement Disorder, more notoriously in the lower extremities.

Conclusion: To our knowledge, this is a unique documented PCD case with the presence of Alpha-Delta Sleep, presenting PLMS, and Rhythmic Movement Disorder. Comprehensive screening protocols, neuropsychiatric evaluation, and additional sleep studies should be considered to evaluate these complexities in patients with PCD. Further studies are required to identify whether these sleep-related disorders are due to neurophysiologic manifestations as seen with Alpha-Delta Sleep, a neurodevelopmental or neurodegenerative process associated with this ciliopathy. Multicentric clinical trials are essential for this type of ciliopathy, especially among Puerto Rican and Hispanic populations.

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1148

NARCOLEPSY WITH CATAPLEXY IN A PEDIATRIC PATIENT WITH A THALAMIC MASS: A CASE REPORT

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Introduction: A female adolescent patient with gradual hypersomnolence.

Report of case(s): The patient is a 16-year-old with gradual onset of parasomnias, leg cramps, headaches and history of gastroesophageal reflux, and asthma. Her ferritin was low, and a diagnosis of restless legs was made, the patient was started on oral iron supplements without improvement. Intravenous iron replacement therapy was tried with laboratory improvement (>50 ng/ml) but not clinical. Clonazepam and gabapentin were tried without success. Over time, she developed more tiredness and started to fall asleep in class. A sleep study was done which showed primary snoring without evidence of sleep disorder breathing, PLMD index was 4.4, and REM sleep latency was 120 minutes. The headaches got worse, and she was seen by neurology, MRI showed a hyperintense 6mm rounded lesion on the left side of the thalamus. She started pregabalin and remained stable for almost a year. Sleepiness got worse with sleep attacks. She was sleeping 12-14 hours at night with a 1–2-hour nap in the afternoon. A Multiple sleep latency test (MSLT) showed no evidence of sleep-onset rapid eye movement periods (SOREMPs), and the mean sleep latency was 9.6 minutes. She was diagnosed with primary hypersomnolence. Modafinil and methylphenidate were tried for hypersomnolence and added duloxetine for headaches without improvement. A repeated sleep study and MSLT, showed a mean sleep latency of 4.9 minutes without SOREMPs, Epworth Sleepiness Scale (EPS) of 20. Later she started with jerky legs and tripping/falling in gymnastics practice, diagnosis of narcolepsy with cataplexy was made. Sodium oxybate was started with improvement of hypersomnolence (EPS: 8) and cataplexy.

Conclusion: The patient presented with insidious onset of restless legs, migraines, and hypersomnia. In pediatric patients classic narcoleptic symptoms are not always present. Interestingly restless legs and migraines can precede the diagnosis of narcolepsy. Our patient had no SOREMPs on the MSLT on two different occasions but in her last MSLT her mean sleep latency was 4.4 minutes and soon after developed cataplexy. Due to the presence of a thalamic mass, we conclude that this patient has secondary narcolepsy type 1.
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1149
UNRAVELLING THE MYSTERIES OF PEDIATRIC CENTRAL SLEEP APNEA (CSA): A UNIQUE CASE REPORT

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Introduction: CSA in pediatric patients is characterized by pauses in breathing during sleep that result from a lack of drive to breathe. It is estimated to be about 10% of all pediatric sleep-disordered breathing cases. The most common type is primary, also known as idiopathic CSA, unrelated to another medical cause. Other causes include, CSA of prematurity, CSA in certain medical conditions such as congenital heart defects or neurological disorders, and CSA related to medications. We report a case of CSA in the setting of an acute neurological impairment secondary to atypical hemolytic uremic syndrome (HUS) in a pediatric patient.
Report of case(s): A 3-year-old female with chromosome 3p deletion syndrome presents after a recent hospitalization with acute hypoxic respiratory failure status post tracheostomy, for a baseline PSG with capped tracheostomy to evaluate for decannulation. During this hospitalization, the patient developed acute neurological impairment with brain swelling and abnormal signaling in bilateral basal ganglia and thalami, findings consistent with HUS. A baseline PSG (table 1) with capped tracheostomy showed an AHI of 16 events per hour of sleep. She was uncapped per protocol but continued to have worsening AHI of 128 events per hour, predominantly central apneas. An interval brain imaging showed evolving parenchymal injury with encephalomalacia and some resolution of prior swelling, indicating the cause of her CSA to be neurological. She was placed on BIPAP ST with set rate 12, IPAP 10 cm H2O and EPAP 5 cm H2O during sleep. Tracheostomy remained capped during the day but decannulation was deferred due to intolerance of BIPAP via nasal mask on further attempts.
Conclusion: The prognosis for pediatric patients with CSA depends on the underlying cause and how well the patient responds to treatment. Mild CSA may require just observation or medications such as acetazolamide or specific respiratory stimulants to stimulate breathing during sleep. In severe cases, continuous positive airway pressure (CPAP) or bilevel positive airway pressure (BIPAP) therapy may be used to provide mechanical support for breathing during sleep. A multidisciplinary approach involving Pulmonary and Sleep specialists would thus be ideal to manage the complex nature of pediatric CSA.
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1150
ISOLATED NIGHTMARES: AN UNUSUAL PRESENTATION OF NARCOLEPSY?

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Introduction: A nightmare involves an internally generated conscious experience of negative emotional valence. Nightmares typically occur during REM sleep, which is most prevalent during the second half of the night. A young female presented with isolated nightmares, occurring near sleep onset and raising suspicion for narcolepsy.
Report of case(s): A 21-year-old female presented to the sleep center due to experiencing daily nightmares for five years. Nightmares were described as "super realistic", "distressing", and occurred minutes after sleep onset. Nightmare content varied. Some of her nightmare themes included an apocalypse, family members dying, and animals chasing her. She had a remote history of anxiety and was previously prescribed sertraline, which had been discontinued two years ago. She reported no hallucinations, cataplexy, sleep paralysis, dream enactment or excessive sleepiness. She had been using a hormonal transdermal patch for about 2 years. On physical exam, she was noted to have mild bilateral proptosis with white sclera visible above the iris on primary gaze. Polysomnography (PSG) revealed a sleep onset latency of 30.5 minutes, N1 1.5%, N2 47.5%, N3 20.9%, and REM 30.1%. REM sleep latency was short at 63.5 minutes. There were 21.6 arousals per hour. The apnea-hypopnea index was of 0.3 events per hour. The PSG was followed by a multiple sleep latency test (MSLT), which measured a mean sleep latency of 5 minutes 42 seconds during five nap opportunities. The patient experienced REM sleep in both the first and third nap, with a REM sleep latency of 4.5 minutes. The patient's MSLT revealed pathological sleepiness, which supported a diagnosis of narcolepsy without cataplexy, although the patient reported nightmares and not sleepiness.
Conclusion: This is an atypical presentation for narcolepsy, which is characterized by REM sleep abnormalities. Further research, classifications, and diagnostic criteria for clinical REM phenomena associated with narcolepsy should be investigated. Clinicians who treat patients with narcolepsy should monitor not only the characteristic symptoms of narcolepsy, such as cataplexy or sleepiness, but also inquire about oneiric activity.
Support (if any):

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1151
PHARMACOLOGICAL TREATMENT OF PEDIATRIC INSOMNIA--A SUCCESSFUL TRIAL OF DOXEPIN

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Introduction: Insomnia is a common sleep disorder in pediatric patients with neurodevelopmental disabilities. There are no FDA approved medications for insomnia in the pediatric population, and treatment can be challenging. We present a case of successful treatment of sleep maintenance insomnia in a 15-year-old male with doxepin with supportive actigraphy data.

Report of case(s): A 15-year-old male with a past history pertinent for a genetic neurodevelopmental disorder, autism spectrum disorder (ASD) and attention deficit hyperactivity disorder (ADHD) was evaluated in Pediatric Sleep Medicine Clinic for long standing difficulties with sleep maintenance. He experienced frequent, prolonged nocturnal awakenings and early morning awakenings. Previous polysomnogram was negative for sleep disordered breathing. He previously trialed clonidine, guanfacine, trazodone, melatonin, and mirtazapine without significant benefit. Baseline actigraphy demonstrated frequent and prolonged nocturnal awakenings and early morning awakenings. He was initiated on doxepin 3 mg at bedtime, and it was subsequently increased to 6 mg at bedtime. Parental report and repeat actigraphy 4 months later (on doxepin 6 mg) demonstrated improvement in nocturnal awakenings and early morning awakenings.
Conclusion: Up to now, there are no FDA approved medications for the treatment of insomnia in the pediatric population. A prior study of patients with ASD and ADHD demonstrated the use of doxepin provided clinical improvement in sleep onset and maintenance insomnia based on subjective evidence with parental report. In this case, doxepin improved subjective report of insomnia and correlated with objective findings on actigraphy.
Support (if any): NA

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1152

A JOURNEY THROUGH KLEINE-LEVIN SYNDROME: A LONGITUDINAL CASE REPORT

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Introduction: Kleine-Levin Syndrome (KLS) is a rare disease with intermittent episodes of hypersomnia with behavioral abnormalities. We present a case of KLS with successful symptomatic treatment with modafinil and eventual remission.
Report of case(s): A 19-year-old healthy male with no prior sleep disorders was referred for evaluation of hypersomnia. He developed leg cellulitis requiring antibiotic therapy. Shortly afterwards, he developed abnormal behaviors --quitting school, estrangement from friends, sleeping 20 hours a day, irritability, and suppressed appetite. He also demonstrated hypersexuality and disinhibited behaviors. After 10 days, he abruptly returned to baseline and had limited recall of the prior events. Three months later, he had a second episode with similar behavioral and sleep changes, again followed by spontaneous return to baseline after 10 days. Two months later, a similar spell occurred, prompting arrangement for psychiatric admission and initiation of quetiapine for a proposed diagnosis of rapid-cycling bipolar disorder. His symptoms again resolved spontaneously. Diagnostic tests including liver function tests, thyroid function tests, ammonia level, urine drug screen, Lyme disease, MRI brain, EEG, and CSF analysis were unremarkable. He was eventually referred to the Sleep Medicine clinic for evaluation. There were no symptoms suggesting other comorbid sleep disorders, and he had a normal neurologic and physical exam at time of presentation. A clinical diagnosis of KLS was made. The patient and family deferred prophylactic or abortive treatment (such as lithium, carbamazepine, or steroids) due to potential for side effects. Modafinil provided symptomatic benefits during the three milder episodes he had over the next few years. Episodes subsequently resolved and the patient is currently in remission (over 5 years) without sequalae.
Conclusion: KLS is a rare disease with typical onset during young adulthood, manifesting with abrupt onset of recurrent episodes of hypersomnia and prolonged sleep duration, lasting from days to several weeks. The diagnosis is clinical and requires at least one additional feature including: cognitive dysfunction, derealization, major apathy, or disinhibited behaviors. Patients revert to baseline between the episodes. Stimulants such as modafinil can promote wakefulness during the episodes.
Support (if any): N/A

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1153

MANY REASONS FOR RESTLESS LEGS, NOT TO REST

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Introduction: Restless leg syndrome (RLS) involves an urge to move the legs that is exacerbated by rest, relieved by movement, and most prominent in the evening. While RLS is commonly associated with low ferritin, here we present a complex case in a patient requiring phlebotomy for symptom control related to elevated ferritin levels.
Report of case(s): A 52 year-old male presented with uncontrolled RLS diagnosed 12 years prior. Sleep history included obstructive sleep apnea (OSA) on CPAP and hypersomnolence. Diagnostic polysomnogram was notable for an AHI 36.4 events/hr with associated hypoxia. Ferritin was 374ng/mL. He presented to our clinic on melatonin and wearing socks with bars of soap atop his feet. On exam, he was obese and plethoric with significant hypersomnolence despite excellent CPAP compliance. He was previously treated unsuccessfully with a combination of phenobarbital, trazodone, and ropinirole, which exacerbated his hypersomnia. He drank 4-5 liters (L) of soda daily. In the 5 years after initial presentation, he went through periods of total cessation to drinking up to 12L a day. He eventually developed uncontrolled diabetes, hypertension, hyperlipidemia, and NASH with advanced fibrosis. He was referred to Hematology and underwent therapeutic phlebotomy every 2-4 months. He was found to have HFE-C282Y Heterozygous mutation and NASH fibrosis without iron overload on MRI. His RLS was eventually controlled with a combination of pramipexole 1.5 mg, gabapentin 1800 mg, alprazolam 0.5 mg along with therapeutic phlebotomy to maintain a ferritin level less than 250 ng/mL. His hypersomnia was managed with amphetamine-dextroamphetamine.
Conclusion: RLS has been associated with high serum ferritin, iron, and saturation transferrin index levels with a low transferrin level due to impaired mobilization of stored iron. Iron deposits can be seen on MRI in the globus pallidus, dentate, red nuclei and substantia nigra. In this patient, soda cessation would help improve his diabetes, thereby decreasing chronic inflammation and lowering ferritin levels. Chronic liver disease, HFE C282Y mutations, and hypoxia from OSA can also contribute to increased ferritin levels. Abstaining from caffeine can likewise improve symptoms of RLS as caffeine is known to heighten proprioceptive awareness and increase neuromuscular reactivity which may include myoclonus.
Support (if any):

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1154

LIFE THREATENING OBSTRUCTIVE SLEEP APNEA IN A PATIENT WITH JOUBERT SYNDROME AND PIERRE ROBIN SEQUENCE

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Introduction: Joubert syndrome is a recessive, multisystem genetic disorder classically resulting in cerebellar and brainstem malformations recognizable as the "Molar Tooth Sign" on magnetic resonance imaging (MRI). Respiratory complications in these patients include disordered control of breathing, hypoventilation, central sleep apnea and hyperpnea. Obstructive sleep apnea and Pierra Robin syndrome have also been reported, however the use of mandibular distraction in the population has not been well described.

Report of case(s): Here we present a 17-month-old male who was diagnosed with Joubert syndrome at 2 months of age after MRI imaging demonstrated the "Molar Tooth Sign" and whole exome sequencing identified a CEP41 mutation. He was also found to have micrognathia, retrognathia and glossoptosis consistent with Pierre Robin sequence. Polysomnography (PSG) in the prone position (as patient did not tolerate the supine position) demonstrated an obstructive apnea hypopnea index (oAHI) of 19.3. Based on this study, mandibular distraction was performed. Following this procedure, the patient was weaned to room air. His respiratory status later worsened, with frequent apneas requiring bilevel positive pressure support (BPAP). A titration PSG was performed, but no acceptable BPAP setting was found. Tracheostomy was discussed, and ultimately the family declined. The patient improved on BPAP with intermittent breaks with low flow nasal oxygen when awake. On follow up, the patient's respiratory status improved and he was tolerating BPAP therapy with sleep without issue. However, during a respiratory illness the patient unfortunately passed away.

Conclusion: Respiratory and sleep-related complications are frequent in patients with Joubert syndrome. This case emphasizes the importance of the recognition and treatment of these complications and points to the need for further research of this population. This case is also unusual as the use of mandibular distraction in patients with Joubert syndrome is not frequently described.

Support (if any): Bachmann-Gagescu, Ruxandra, et al. "Healthcare recommendations for Joubert syndrome." American journal of medical genetics Part A 182.1 (2020): 229-249.

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1155

EXPLORING VAGUS NERVE STIMULATION (VNS) AND ITS RELATIONSHIP WITH SLEEP APNEA: IMPLICATIONS AND INSIGHTS

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Introduction: Obstructive Sleep Apnea (OSA) is characterized by recurrent partial or complete blockage of the upper airway during sleep, leading to disruptions in breathing and intermittent oxygen desaturation, putting patients with epilepsy at risk for seizure exacerbations. However, literature about the development or progression of OSA in patients with a vagus nerve stimulator (VNS) refractory epilepsy is limited.

Report of case(s): Case of a 42-year-old female with history of right lobe temporal epilepsy since childhood, temporal lobe surgery for epilepsy, currently on VNS who complained of snoring and daytime sleepiness. An Epworth Sleepiness Scale was obtained with a score of 18/24 (high). Physical examination revealed mallampati score of II, BMI: 24.62 kg/m^2, 139 lb weight, 14-inch neck circumference, and a STOP-Bang sleep score of 2/8 (low-risk). During the initial polysomnography (PSG), the patient exhibited mild to moderate OSA, with associated hypoxemia and disruption in sleep architecture, as reflected by the baseline apnea/hypopnea index (AHI) of 13.5/hr (normal: < 5/hr). The REM AHI (AASM) was 12.3/hr, and the respiratory events and desaturation pattern exhibited an atypically periodic nature, occurring approximately every 3.6 minutes with fixed respiratory events lasting around 29-30 seconds. This periodicity was likely associated with the activation of the VNS implant.

Conclusion: To our knowledge, this case is novel and important in raising awareness of screening for sleep-related disorders, given the limited research about VNS leading to such manifestations. What is significant about this case is that routine tools typically used did not provide sufficient clarity for diagnosing this patient. Instead, a thorough evaluation was required where there are no clear guidelines to evaluate possible VNS-induced sleep-related disorders. The mechanisms involved are complex and diverse. Some proposed causes include respiratory disturbances with changes in airflow, primarily attributable to vocal cord paresis, supraglottic spasm, laryngeal muscle stimulation, or alterations to the brainstem's respiratory center and relay of information, among other possible mechanisms. Further studies are necessary to understand these manifestations, especially in underserved regions like the Puerto Rican and Hispanic populations, where access to sleep studies and research is limited.

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1156

"NIV NAP" TO IMPROVE PAP ACCEPTABILITY AND HYPOVENTILATION IN NEUROMUSCULAR DISEASE

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Introduction: Respiratory failure is the most common cause of death in patients with several types of neuromuscular disease (NMD), including myotonic dystrophy type 1 (MD1). Noninvasive ventilation (NIV) is the cornerstone of treatment, but consistent use and acceptability remain a challenge. While nap-titrations have improved CPAP adherence in obstructive sleep apnea (OSA), we present a case where increased use and optimization of therapy was achieved through a daytime nap NIV titration.

Report of case(s): 47-year-old man with MD1, obesity , and mild OSA with long-standing PAP intolerance presented with dyspnea and hypoxia. Blood gas was suggestive of hypoventilation and work-up for hypoxia including CT chest with pulmonary artery protocol and echocardiogram with bubble were unremarkable. BIPAP and supplemental oxygen were applied with subsequent improvement. Pulmonary function testing

was also consistent with hypoventilation, featuring MIP of 14 cmH2O (15% predicted), FVC of 3.30L (65% predicted), and no diffusion impairment. Shortly after discharge, patient was transitioned to NIV with iVAPS with EPAP 5 cmH2O, PS 4-12 cmH2O, TV 6cc/kg, and RR 12 with 4L oxygen. Despite consistent use, ongoing hypoxia was noted on home oximetry testing. The patient was then brought into the sleep lab for a daytime NIV titration study, or "NIV Nap." During this 2-hour study, he was found to have persistent obstructive events, and was titrated to BIPAP S/T with EPAP 10 cm H2O, IPAP 16 cm H2O, RR 16, and I-time of 0.8-1.5 seconds which achieved optimal therapy for his OSA and hypoventilation. Following this titration, he was able to weaned off of nocturnal oxygen and reported improved symptoms. At 30-day follow-up, remote data demonstrated NIV usage 100% of days, >4-hour/day usage of 87%, residual AHI of 1.3/hr, average TV of 519 mL, and average MV of 10.8 L/min.
Conclusion: While daytime nap titrations have been used with good effect in patients with OSA, this tool has been underutilized in patients with neuromuscular disease and complex hypoventilation. Daytime "NIV Naps" can allow for increased acceptability of treatment while assuring safe and effective NIV therapy, and in this case demonstrated an increase in use.
Support (if any): N/A

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1157

OBSTRUCTIVE SLEEP APNEA SYMPTOMS CAUSED BY AN OCCULT SEIZURE DISORDER WITH A BRAIN TUMOR FOCUS

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Introduction: Complex nocturnal behaviors are one of the most difficult diagnostic challenges in sleep medicine. The sensitivity of electroencephalography (EEG) varies with the study duration, epileptogenic lesion location, electrode placement, and the presence of events. A normal isolated EEG is insufficient to exclude an underlying seizure disorder particularly when diagnostic uncertainty remains. Polysomnography (PSG) is the gold standard for the evaluation of obstructive sleep apnea (OSA), and that has demonstrated a bidirectional relationship between OSA and comorbid epilepsy. This case report highlights an adolescent male with seizure-like symptoms initially diagnosed with OSA with refractory nocturnal episodes on continuous positive airway pressure (CPAP) for years until his eventual clinical diagnosis that was prompted by a repeat PSG.
Report of case(s): A 14-year-old biological male with a history of snoring and excessive daytime sleepiness reported multiple episodes of unresponsiveness during sleep associated with shaking activity and self-reported desaturation at home. Initial episodes terminated upon repositioning of his body, however episodes and symptoms persisted despite treatment with positional therapy and CPAP. He had no clinical episodes during an unrevealing 72-hour EEG study. A repeat diagnostic PSG demonstrated an apnea-hypopnea index (AHI4%) of 1.1 events/hour, an AHI3A of 5.3 events/hour, and an SpO2 nadir of 92%. When the lights were turned on the patient exhibited repetitive facial movement upon awakening with poly-spikes on the corresponding EEG leads. This was followed by an inpatient admission for continuous EEG that demonstrated focal to bilateral tonic-clonic seizure during sleep of left-sided origin. MRI showed a 1.7 cm left basal temporal lobe tumor that was likely the seizure focus. He was discharged on levetiracetam, and ultimately underwent a posterior temporal lesion resection with resolution of his symptoms, including paroxysmal events and excessive daytime sleepiness.
Conclusion: Suspected nocturnal seizures often requires comprehensive and repeated testing modalities as an interictal EEG may fail to detect a seizure disorder and the presence of OSA does not eliminate the possibility of comorbid epilepsy. It is paramount to maintain a heightened index of suspicion as untreated OSA and epilepsy may have additive detrimental health effects. Appropriate identification as in our case may have a curative effect.
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1158

SLEEP DISORDERS IN A FEMALE WITH HYPERMOBILITY SPECTRUM DISORDER INCLUSIVE OF HYPERMOBILE EHLERS DANLOS SYNDROME

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Introduction: Hypermobility spectrum disorder (HSD) and hypermobile Ehlers-Danlos syndrome (hEDS) are conditions characterized by joint hypermobility and musculoskeletal complications including pain, atraumatic joint dislocations and joint instability. They are often associated with other comorbidities including but not limited to dysautonomia, GI disturbances, anxiety, depression, sleep disorders and chronic fatigue. There are no known genetic markers for HSD/hEDS, they are clinical diagnoses. The nomenclature for these conditions has evolved recently and there are ongoing discussions regarding the best way to characterize these populations. Data on the prevalence of HSD and hEDS are still limited. We are reporting a case describing multiple, long-standing sleep concerns in a young woman with recent evaluation by a geneticist.
Report of case(s): Patient is a 25-year-old Caucasian female with initial past medical history notable for anxiety, depression, asthma, irritable bowel syndrome, POTS, scoliosis and vasovagal syncope. On presentation at age 24, the patient reported a family history of hEDS in an aunt and reported multiple family members with joint hypermobility. She had not seen a geneticist for evaluation but reported symptoms concerning for HSD/hEDS. Patient presented to clinic with multiple sleep concerns including sleep paralysis that had started in childhood, sleep-related hallucinations, snoring, witnessed apneas, unrefreshing sleep, fatigue and crawling sensations in legs that improved with movement. Patient had a home sleep study and was diagnosed with mild obstructive sleep apnea. Patient was initiated on PAP therapy but did not tolerate the mask. She reported some benefit to sleep concerns when she was able to utilize therapy. Lab work showed low ferritin. Patient has not been initiated on iron therapy yet. Patient established care with a geneticist and was informed that her past medical history, symptoms and exam were consistent with HSD inclusive of hEDS.
Conclusion: This case focuses on sleep disorders and sleep concerns in a patient with a clinical diagnosis of HSD/hEDS. Diagnosis of these hypermobility joint disorders is evolving and

with that sleep disorders in these patients are becoming better characterized. Management of HSD/hEDS is symptomatic at this time and patients would benefit from thorough evaluation so as to improve their sleep and overall quality of life.
Support (if any):

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1159
THE CYCLICAL DAYTIME SLEEPER: A RARE CASE OF A SIGHTED TEENAGER WITH NON-24-HOUR SLEEP-WAKE DISORDER

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Introduction: Daytime fatigue in teenagers may be hand-waved as hours of screen time the night before and it can be difficult for families to accurately describe sleep habits. These factors quite often obscure an underlying sleep disorder. Here we report the rare case of a sighted teenage patient who presented with sleep disturbance and erratic bedtimes and was found to have non-24-hour sleep wake disorder (N24SWD).
Report of case(s): 16-year-old male with a past medical history of ADHD and insomnia, presented to clinic for evaluation of recurrent and inappropriate sleep time with residual hypersomnolence. Pediatrician first saw the patient for difficulty waking up for school as well as trouble falling asleep at night. Initially, it was suspected to be insomnia due to poor sleep hygiene secondary to significant electronic usage prior to bedtime. When symptoms did not improve, the patient was started on hypnotics including clonidine to help with sleep and daytime stimulant medication was adjusted to help with wakefulness. Pharmaceuticals did not help with sleep symptoms, and the patient's hypersomnolence led to cyclical absenteeism from school and risk for expulsion. On initial presentation to the sleep clinic, patient and family had difficulty describing his erratic sleep routine. Two weeks of sleep diaries were provided to help characterize the patient's sleep patterns. No suspicion for sleep disordered breathing, parasomnias nor restless leg syndrome were noted. Sleep diary showed a sleep pattern delaying consistently by 1-2 hours each day. Total sleep each night was 7-9 hours, with sleep onset latency of 30 minutes and no significant awakenings. This activity is classic for non-24 sleep-wake phase disorder. This patient was treated with a combination of timed tasimelteon and bright light therapy along with chronotherapy for resynchronization of the intrinsic circadian rhythm.
Conclusion: N24SWD is commonly seen in blind individuals affecting up to 50% of that population. It is very rare in sighted individuals, and may be harder to discern when confounded with conditions like ADHD or poor sleep hygiene. Having patients complete a sleep diary is a cost effective and low investment intervention that may elucidate their condition and ensure timely treatment.
Support (if any):

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1160
EXAMINING CRITERIA IN HYPOGLOSSAL NERVE STIMULATION: A CASE INSIGHT

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Introduction: Introduced in 2001, the hypoglossal nerve stimulator (HGNS) is an implantable device designed to treat moderate to severe obstructive sleep apnea (OSA). FDA-approved on May 1, 2014, it offers an alternative for patients unable to benefit from continuous positive airway pressure (CPAP) therapy. However, not all patients may benefit, leading to the establishment of exclusion criteria based on factors such as body mass index, central and/or mixed apnea index >25%, complete concentric palatal collapse, patient age, and certain comorbidities such as neuromuscular and cardiac diseases. It is important to consider these criteria when screening patients to ensure the appropriate use of the device. Here, we present a case illustrating a patient who received a HGNS device according to established criteria but may not have been an ideal candidate.123
Report of case(s): A 55-year-old male with a history of hyperlipidemia, depression, and hypothyroidism status post (s/p) thyroidectomy to treat multinodular goiter, moderate OSA (AHI 16.2 events/hr) s/p uvulopalatopharyngoplasty and failed CPAP tolerance, underwent HGNS implantation. Post-procedure, an abnormal electrocardiogram led to a referral to cardiology, where he was found to have heart failure with a reduced ejection fraction of 20%. A follow-up titration polysomnography showed central events, presumed treatment emergent, following HGNS implantation. He is currently being monitored by cardiology for the optimization of his heart failure. Upon re-evaluation of his initial pre-implantation study, we felt that several of the hypopnea events may have been central hypopneas. Although his OSA is controlled with the HGNS, the patient still has central sleep apnea that is not being treated.
Conclusion: There is a lack of routine differentiation between central and obstructive hypopneas in current assessments, which poses a potential oversight in patient selection, impacting treatment planning. Central hypopneas should be included when assessing the 25% threshold of central events that would otherwise exclude a patient from receiving treatment. This case highlights the need for more stringent scoring criteria, specifically incorporating central hypopneas, to better screen high-risk patients and identify optimal candidates for hypoglossal nerve stimulation.
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1161
FROM RESTLESS TO REST – THE USE OF METHADONE TO TREAT COMPLEX RLS IN PATIENTS WITH SLEEP APNEA: A CASE SERIES

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Introduction: Typically, patients with restless leg syndrome (RLS) respond well to standard therapies such as dopamine agonists and alpha-2-delta calcium channel ligands. However, patients with refractory RLS may require opioids for optimal disease control 1. In the setting of concomitant obstructive sleep apnea (OSA), characterized by upper airway collapse leading to recurrent episodes of upper airflow obstruction and intermittent hypoxemia, opioids can further increase respiratory depression. Consequently, many clinicians may be hesitant to prescribe opioids in such patients. The following cases highlight chronic opioid use in patients with concurrent RLS and OSA.
Report of case(s): Case 1: A 77 year-old man with OSA on continuous positive airway pressure (CPAP) presented to sleep clinic

for optimization of longstanding RLS. Initial interventions with standard therapy were ineffective. He was started on methadone with good control of his symptoms, but eventually developed central apneas. He was subsequently switched to BiPAP ST with a residual AHI of 2.6 events/hr. His RLS remained stable on methadone 10-12.5 mg night. Case 2: A 72 year-old man with a history of low back pain previously managed with opioids, presented to sleep clinic for severe OSA and RLS. His RLS symptoms were initially controlled with gabapentin and pramipexole, but he experienced augmentation after self-titrating to high doses. His RLS was optimized with methadone 10 mg. However, he could not tolerate CPAP despite multiple interventions. In order to continue methadone, he lost 60 pounds with significant improvement in his OSA on repeat testing (AHI 6.1 events/hr). He was able to maintain weight loss and continue methadone therapy. Case 3: A 77 year-old female with long standing RLS on methadone for 20 years presented to sleep clinic for follow up of RLS. Her RLS was refractory to standard therapy. Since initiation of methadone, she gained significant weight. A repeat sleep study demonstrated moderate OSA (AHI 28.3 events/hr). She did well on CPAP with excellent compliance (Residual AHI 5.8 events/hr). She remained stable on methadone 20-30 mg daily.
Conclusion: Here we demonstrate that in the right setting, patients with RLS in the setting of OSA can be safely treated with opioid medications.
Support (if any):

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1162
KERATOCONUS IN AN ADOLESCENT WITH OBSTRUCTIVE SLEEP APNEA

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Introduction: Obstructive sleep apnea (OSA) is common in pediatrics. Signs of OSA vary between patients commonly reflecting an obstructed upper airway with hypoventilation and hypoxemia. There is less knowledge of the ophthalmologic findings in OSA. Corneal thickness is sensitive to oxygen desaturations that occur during sleep and may contribute to the development of keratoconus. Based on the IRIS Registry, the prevalence of keratoconus in adults is 2.9% compared to 0.27% in pediatrics. We describe a pediatric patient with keratoconus, who was found to have severe OSA.
Report of case(s): 14-year-old male with history of obesity, tonsillar hypertrophy and bilateral keratoconus s/p corneal crosslinking was admitted to the hospital for corneal transplant. Post-operatively, it was difficult to wean the patient off oxygen and inpatient he required 3L oxygen due to significant nocturnal hypoxemia. With concurrent morning headaches, witnessed apneas and weight gain (BMI 52.7, >99th percentile) the patient underwent an inpatient split night polysomnogram. Results revealed severe OSA (AHI 123/hr) and hypoxemia (O2 baseline 89-91%, nadir 64% O2, ODI 105.1/hr, < 90% for 40% of TST) without significant hypoventilation (PETCO2 43 - 54mmHg, >50mmHg for 1% TST). He was titrated to CPAP 15cm H2O with resolution of sleep apnea (AHI 0.7, SpO2 92 - 98%). Echocardiogram showed normal right ventricular size, ejection fraction and negative for signs of pulmonary hypertension. Chest x-ray was unremarkable. He was initiated on PAP therapy, and subsequently underwent adenotonsillectomy 5 months later. He continues to follow with ophthalmology and uses prednisolone eyedrops regularly.
Conclusion: Ocular presentations are a less recognized sign of OSA particularly in pediatric patients. In adults, the intermittent hypoxemia and airflow limitations could contribute to ocular pathology and severity in presentation. Keratoconus has been associated with elevated levels of matrix metalloproteinases and protease inhibitors, which may play a role in corneal thinning in individuals with OSA. Pediatric keratoconus has been described as more aggressive compared to adults leading to more rapid deterioration. The progression of ocular disease in our patient may have been a consequence of untreated OSA. Our report highlights the importance of early recognition and treatment of OSA in pediatric patients.
Support (if any):

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1163
CENTRAL SLEEP APNEA: A POSSIBLE RARE ADVERSE EFFECT OF VAGUS NERVE STIMULATION

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Introduction: Vagus nerve stimulation (VNS) is a neuromodulation therapy for treatment of drug-resistant epilepsy (DRE). VNS therapy is known to affect sleep by increasing risk for obstructive sleep apnea (OSA). We present the case of a young woman with DRE and mild OSA who was found to have central sleep apnea (CSA) five years after VNS placement. Based on our literature review, there are limited case reports on this topic.
Report of case(s): A 22-year-old female with a history of Tuberous Sclerosis and DRE, couple months' status post-VNS placement presented for snoring and gasping arousals. She underwent Polysomnography (PSG), which documented mild OSA, with an apnea-hypopnea index (AHI) of 8.6 and associated oxygen desaturation nadir of 82%. Average transcutaneous CO2 (TcCO2) monitoring during supine wakefulness was 43.1 mmHg and during sleep was 44.2 mmHg respectively. She had a titration PSG, which noted that a Continuous Positive Airway Pressure (CPAP) setting of 6 cm of water was effective in treating her OSA. CSA was not observed in either of those studies. Five years later, the patient returned for a routine follow-up. Her home CPAP data review showed that despite a four-hour compliance of 90%, the average CPAP-generated AHI was 14.9. Titration PSG was performed, which showed frequent obstructive and central apneas. Bilevel PAP in ST mode was tested at 15/10 cm of water with a respiratory rate of 10 per minute, which helped apneas. However, obstructive and central hypopneas persisted in this setting. Additionally, global hypercarbia was observed with an average TcCO2 value of 51.9 mmHg during supine wakefulness and 60mmHg (412 minutes > 55mmHg) during sleep, respectively. An MRI two years prior to this titration PSG showed no structural cause for the central apnea. She has never been on opioids and her BMI (30.5) has remained largely unchanged in the past five years. She is planned to have a follow up for further evaluation including changes in VNS settings and a retitration PSG study.

Conclusion: CSA remains an unexplored possible adverse effect of VNS implantation. Further investigations are needed to establish a direct correlation between VNS implantation and CSA.
Support (if any): none

Abstract citation ID: zsae067.01164

1164

SLEEP CONVERSION OF ATRIAL BIGEMINY TO SINUS RHYTHM AND USING OXIMETRY FOR HEART RATE

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Introduction: Patient presented for PSG with initial wake, N1 period showing bigeminy on ECG that converted to sinus rhythm during N2, N3, and REM. SR persisted despite periods of hypoxemia until the end of the study. Furthermore, the heart rate, as generated using oximetry and Polysmith, would not recognize the bigeminal beat underestimating heart rate by half.
Report of case(s): A middle-aged female was referred to Sleep Medicine for difficulty falling asleep, staying asleep, snoring, witnessed apneas. Epworth Sleepiness Scale score (ESS) was 9/24. PSG was performed using Polysmith software. Epochs showed: Wake: bigeminy on EKG and corresponding plethysmography with one large peak (the visible P wave) and one small peak (where P is hidden in the preceding T wave). Only the first P wave is used to generate heart rate. A clear transition can be seen within a single epoch in N1: EKG changes from bigeminy to SR with corresponding plethysmography showing two peaks (as in wake) that convert to a single peak in sinus rhythm. Heart rate is then correctly accounted for midway through the epoch. N2 and REM: SR, single peak on plethysmography, accurate heart rate continue. ECG approximately one week prior to PSG showed sinus bradycardia.
Conclusion: While there has been no mention of atrial bigeminy and sleep in cardiovascular or sleep medicine literature, one hypothetical reason for its resolution in sleep is the reduction of sympathetic and cholinergic tone. As for the spurious heart rate on oximetry, software did not recognize the smaller plethysmography peak, underestimating heart rate by half during periods of bigeminy. Atrial bigeminy is associated with heart failure, alcohol, electrolyte derangement, caffeine and usually left untreated in asymptomatic patients. Patients with symptoms, such as palpitations, dizziness, near syncope, or syncope can be treated with β-blockers, calcium-channel blockers, or catheter ablation. While this patient did not complain of symptoms, recent labs did show hypomagnesemia and hypokalemia.
Support (if any):

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1165

A CHALLENGING CASE OF CHRONIC FENTANYL USE INDUCING CENTRAL SLEEP APNEA AFTER TRACHEOSTOMY

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Introduction: It's always challenging to diagnose central sleep apnea (CSA) in related to chronic opioid use.
Report of case(s): A 66 years old male with a significant history of myasthenia gravis, obstructive sleep apnea, depression, and asthma. Initial home sleep apnea test (HSAT) AHI: 65. However he could not tolerate PAP therapy and eventually underwent an oral device. The repeated HSAT AHI while on oral appliance was 30.3. Due to poor compliance, he has been off both treatments for a few years until he was seen in our clinic with excessive daytime sleepiness (EDS), fatigue, loud snoring and witnessed gasping events. His Epworth scale was 24. His medications were remarkable for fentanyl 150 mcg patch daily for chronic pain. His BMI is 28. A new in-lab polysomnography (PSG) showed AHI of 57.9 with mild central apnea index 5.1. BIPAP 20/16 was recommended under titration. The patient declined PAP therapy and surgery. Subsequently, he underwent tracheostomy and his symptoms were much improved. However he was still having residual EDS. A repeated PSG was done with his tracheostomy with AHI: 107 but all the apnea and hypopnea events were central in origin. The study showed a very irregular and ataxic breathing without Cheyne-Stokes breathing. His ECHO shows an ejection fraction of 51%. All other blood work up was unremarkable. It was believed that his central apnea had been induced by chronic opioid use based on Morphine Milligram Equivalents (MME). Prevalence of CSA in patients taking chronic opioid is 24%. CSA due to opioids is associated with abnormal breathing patterns (ataxic, biot and/ or cluster). The morphine equivalent daily dose (MEDD) or Morphine Milligram Equivalents (MME) is strongly associated with the severity of sleep breathing disorders (SBD) predominantly CSA. Studies have shown that ataxic breathing during NREM was more frequent at MED ≥ 200. Our patient's fentanyl dose of 150 mcg patch equals 360 MME which puts him at an extreme risk of CSA.
Conclusion: It's important to calculate MME among patients with opioid to avoid risk of inducing central sleep apnea.
Support (if any): None

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1166

LONG-TERM BUPRENORPHINE USE AND PREVALENCE OF SLEEP APNEA: A CASE SERIES

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Introduction: It has been well documented that opiate use is a risk factor for developing sleep apnea. We suspect that buprenorphine being a partial-opioid-agonist to also be a risk factor for developing sleep apnea. Study by Farney et al showed an association between Buprenorphine use and sleep apnea. But the literature also has contradictory findings in which a publication by Grunstein et al showed that by switching from methadone to buprenorphine pre-existing sleep apnea was eliminated, although this study only observed the effects of only short-term buprenorphine use. There is a gap in understanding the prevalence and specific risk factors associated with sleep apnea in chronic buprenorphine.
Report of case(s): Patient 1: 46-year-old male. Medical History: Obesity, hypertension, coronary artery disease. Former smoker (15 pack year smoking history) Buprenorphine Use: 6 years for opioid dependence. Sleep Study: Central sleep apnea- hypopnea index of 10.3, unresponsive to CPAP titration. Patient 2:

66-year-old male Medical history: Chronic back pain, smoker Buprenorphine Use: 6 years for chronic back pain. Sleep Study: Central sleep apnea- hypopnea index of 4.5, unresponsive to CPAP titration. Patient 3: 47-year-old female. Medical History: Obesity, narcolepsy. Buprenorphine Use: 6 years. Sleep Study: No evidence of central sleep apnea on initial and subsequent studies. Patient 4: 28-year-old male. Medical History: Obesity. Buprenorphine Use: 8 years for chronic pain or opioid dependence. Sleep Study: No central sleep apnea on initial study. Subsequent study revealed central sleep apnea with central apnea- hypopnea index (AHI) of 2.9. Patient 5: 68-year-old male. Medical History: Atrial fibrillation, hyperlipidemia, chronic kidney disease, cigarette smoker, obesity. Buprenorphine Use: 8 years for chronic pain or opioid dependence. Sleep Study: Initial study showed central AHI of 0.5. Subsequent study revealed an increase in central AHI to 13.1.

Conclusion: The presented cases raise awareness of a possible link between long- term buprenorphine use and sleep apnea. This case series underscores the importance of monitoring individuals on long-term buprenorphine therapy for the potential development of sleep apnea. Further research is needed to elucidate the underlying mechanisms and explore management strategies for individuals facing this complication of buprenorphine therapy.

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1167

CHASING CENTRALS

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Introduction: Distinguishing between obstructive and central hypopneas raises a clinical challenge when evaluating sleep apnea. Currently, absence of snoring, inspiratory flow limitation, and paradoxical thoraco-abdominal excursions can aid in identifying a central hypopnea. Defining these events is imperative as it affects options for therapy. This case highlights the importance of appropriate classification of central hypopneas.

Report of case(s): A 57 YO F with PMH of HTN presents for snoring, frequent awakenings, and suffocation disrupting sleep. Her BMI is 35.5. Epworth Sleepiness Scale is 15. She has a family history of sleep apnea. Her STOP-BANG score is 4. In conjunction with sleep disordered breathing evaluation, she was undergoing neurologic evaluation of oropharyngeal dysphagia resulting in ILD from aspiration, weakness and numbness in bilateral hands, and worsening balance. Imaging showed a Chiari 1 Malformation. She underwent PSG to evaluate SBD and split for CPAP titration due to frequent apnea and hypopnea events. Despite titration, events worsened. Upon further review of the study, it was noted the hypopnea events were majority central in nature. The diagnostic portion showed 32 central apneas, 2 obstructive apneas, 0 mixed apneas, 49 central hypopneas and 4 obstructive hypopneas. The total AHI was 44/h with a central index of 42/h and O2 nadir of 71% with O2 less than 88% for 70 minutes. She returned for ASV versus Bipap ST titration. Again, pressures were increased due to presence of hypopneas and at the termination of the study, apnea was poorly controlled. The residual AHI of 50/h on BIPAP 18/8 rate 16. Review of PSG found optimal settings to be BIPAP 15/6 rate16. AHI on these settings was 8.9/h, nadir SPO2 82%. She is currently scheduled for chiari decompression.

Conclusion: This case demonstrates that detection of central hypopneas affects ability to titrate PAP therapy and determine best treatment options. This case is further complicated by a clinical history concerning for obstructive sleep apnea.

Support (if any): Javaheri S, Rapoport DM, Schwartz AR. Distinguishing central from obstructive hypopneas on a clinical polysomnogram. J Clin Sleep Med. 2023 Apr 1;19(4):823-834. doi: 10.5664/jcsm.10420. PMID: 36661093; PMCID: PMC10071374.

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1168

SNORING CESSATION IN A CASE OF VAGAL NERVE STIMULATOR INDUCED OBSTRUCTIVE HYPOPNEA

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Introduction: Vagal nerve stimulators (VNS) have been found to induce sleep disordered breathing and many patients will seek sleep evaluation after the development of symptoms. Snoring is a common reason patients may present. Once therapy is initiated, the lack of snoring is often used as a clinical marker for reduced apnea. Here we present the counterintuitive case of a VNS patient who had treatment-refractory obstructive sleep apnea with snoring that halted during apneic episodes.

Report of case(s): A 24-year-old male, past medical history of medically refractory epilepsy w/ VNS, developmental delay with minimal verbal output, sleep apnea treated with CPAP (Continuous Positive Airway Pressure), presented for a split night polysomnogram based on reports of witnessed nocturnal apneas despite treatment with CPAP. To find new CPAP settings for worsening apnea we performed a split night polysomnogram. During the baseline diagnostic portion of the study the apnea hypopnea index was 40.9 events/hour with severe obstructive sleep apnea consisting of 12 obstructive apneas and 32 hypopneas. Respiratory events were noted to have remarkable chronicity, lasting 30 seconds every 1 min and 10 seconds. The obstructive events were also seen during wake cycles. We discovered his VNS settings were programmed for a 1 minute and 10 second OFF cycle with 30 second ON cycle, coinciding with the periodicity of his apneic events. Additionally, snoring occurred throughout the study but ceased during the hypopneas. VNS artifact was noted in the EKG lead during the 30 second periods of hypopnea in a dramatic time locked obstructive pattern, suggesting VNS induced collapse of the upper airway during VNS ON phase.

Conclusion: This is a report of VNS induced cessation of snoring with paradoxical worsening of hypopneas, as well as awake hypopnea events. VNS can induce sleep apnea and our study shows lack of snoring is not a reliable indicator of lack of hypopnea due to the adduction of vocal cords and resultant laryngeal collapse. We suggest that all patients with a VNS implanted device undergo a sleep study to evaluate for VNS induced OSA after implantation of VNS, and a follow up with a sleep study titration of VNS in select cases.

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1169

HYPERSOMNIA IN AN ADOLESCENT FOLLOWING COVID-19 INFECTIONS

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Introduction: The International COVID-19 Sleep Study found a 2 to 3-fold increase in hypersomnolence in persons reporting COVID-19 infection. Although the pathophysiology of COVID-19-associated hypersomnolence is still unclear, a para-infectious pathogenesis has been proposed, similar to cases of post-influenza narcolepsy observed following the Spanish flu epidemic of 1918.
Report of case(s): A 16-year-old male presented to neurology clinic with complaints of fatigue, anorexia and headaches. His parents reported the sudden onset of excessive daytime sleepiness and sleep attacks in September 2022, severely impacting his daytime functioning. His reported sleep duration was appropriate for his age, and sleep hygiene was adequate. He denied cataplexy and hallucinations, but was having sleep paralysis 1-2 times weekly. He had never been vaccinated against COVID-19, and had two confirmed COVID-19 infections in January and June of 2022. His laboratory evaluation showed no other infectious causes, nor evidence of thyroid dysfunction or other endocrine abnormalities. His brain MRI was unremarkable. In April 2023, he had an overnight polysomnography followed by a multiple sleep latency test. PSG total sleep time was 7 hours and 22 minutes, and sleep efficiency was 93.1%. His sleep latency was 5.3 minutes and REM latency was 99 minutes. His AHI was 1.9 events per hour and his SpO2 nadir was 89%. The mean sleep latency on his MSLT was reduced, at 4 minutes and 36 seconds, and there were no sleep-onset REM periods. At his sleep clinic evaluation in April 2023, his Epworth Sleepiness Scale (ESS) score was 22. He was started on Adderall, which caused severe mood changes and worsening anorexia. This was switched to Modafinil, with significant improvement in subjective sleepiness, and his ESS score was 3 at follow-up.
Conclusion: Untreated hypersomnia has been associated with behavioral problems, mood disturbances, depression, and impaired neurocognitive function especially in adolescents. Hypersomnia is also associated with long-term increased risk of cardiovascular, endocrine, and metabolic disorders. According to the World Health Organization, there have been over 700 million confirmed COVID-19 cases to date. Given the health implications of hypersomnia, the relationship between COVID-19 and CNS hypersomnia and its etiology needs further investigation.
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1170

IRON AND MODAFINIL EFFICACY

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Introduction: Central diseases of hypersomnolence (CDH) are lifelong disorders characterized by excessive sleep and daytime sleepiness. Treatment options include modafinil, armodafinil, psychostimulants, pitolisant, clarithromycin, and gamma-hydroxy butyrate. Although the mechanism of action behind efficacy is poorly understood, modafinil is often the first-line therapy. Modafinil's efficacy relies upon the integrity of brain dopamine (DA) signaling: it increases extracellular dopamine by inhibiting the dopamine transporter (DAT), and genetic deletion of the DAT renders modafinil Synaptic dopamine signaling is further highly dependent upon brain iron availability, leading us to consider whether systemic iron deficiency might impact the efficacy of common wake-promoting agents in CDH.
Report of case(s): A 30-year-old woman diagnosed with Idiopathic Hypersomnia (IH) at the age of 22 self referred to our sleep center expressing concern over the loss of her modafinil's wake-promoting benefits. Her PSG/MSLT had shown a sleep efficiency of 96%, a mean sleep latency of 4.6 minutes, and a single SOREMp on her 2nd nap of 5. She was prescribed modafinil (200mg QAM increased to BID over the past year), which provided symptomatic relief for nearly a decade. Her laboratory work revealed 5% transferrin saturation, low ferritin level (7 ng/ml), and normal CSF iron and orexin levels of 33 ng/ml and 261.8 pg/ml, respectively; therefore, she was started on oral iron supplements. At 2 weeks follow-up, serum transferrin saturation and ferritin levels increased to 23% and 17 ng/ml, respectively. Follow-up CSF orexin level was 266.6 pg/ml , and repeat assessments of CSF iron parameters are pending. After iron repletion, modafinil was restarted and titrated over one week to 200 mg in the morning and 100 mg in the afternoon. Subjective sleepiness improved, as evidenced by the patient regaining confidence in driving safely in excess of 70 minutes continuously. Iron deficiency negatively impacts sleep, vigilance, and motor programs in human infants and impairs synaptic dopamine signaling in animal studies. This could explain why the patient responded to Modafinil after iron was repleted.
Conclusion: Pre-anemic and anemic iron deficiency should be considered a potential readily treatable cause of modafinil's lack of efficacy by way of effects upon wake-promoting brain dopamine circuits.
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1171

HYPERSOMNIA SECONDARY TO LONG COVID

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Introduction: Recognition of Long Covid is increasing. In a recent meta-analysis in youth with Long Covid, the most prevalent clinical symptoms were mood (16.50%), fatigue (9.66%), and sleep disorders (8.42%). However, there is a paucity of data in the management of these symptoms.
Report of case(s): We present a case of severe hypersomnolence after a mild Covid-19 infection in a 13 year-old female with no significant history, an acceptable age-appropriate sleep-wake schedule without nighttime awakenings or sleepiness prior to infection. Post-infection, she developed a one year history of sleep onset and maintenance insomnia, significant circadian delays, sleep inertia, brain fog and headaches. She was referred to sleep medicine and responded to treatment for a circadian rhythm disorder with sleep-wake restructuring, melatonin, and strict sleep hygiene. Sleep fragmentation, unrefreshing sleep, and hypersomnolence persisted; ESS=15/24. Sleep duration was often ≥12 hours in a 24 hour period. The patient could not

wake easily, and often missed school or left early for sleepiness and headaches. A trial of gabapentin 200mg at bedtime failed. Sleep diagnostics were performed. Polysomnography showed no sleep disruptors, 8 hours of sleep, and some delayed slow wave sleep periods. Mean sleep latency testing (MSLT) showed MSL of 15.4min; 1 SOREM (nap #1). With a working diagnosis of hypersomnia due to medical condition vs. idiopathic hypersomnia, methylphenidate up to 36mg ER was trialed with some improvement. A recent adult case with Long Covid and ADHD-like syndrome also responded to stimulant use, though no guidelines are established for Long Covid. Oxybate was later added up to 2g once nightly which helped resolve sleep inertia, improve sleep quality and reduce sleepiness(ESS=4/24). She was able to return to school full time and reached normal functioning.
Conclusion: While the pathophysiology of Long Covid is still under investigation, symptom management of sleepiness can impact functioning. This case demonstrates a successful treatment of a patient with Long Covid and hypersomnolence with resolution of excessive sleepiness, morning inertia, and sleep fragmentation with a treatment approach similar to that of idiopathic hypersomnia, using an oxybate along with daytime stimulant use.
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1172
HOOPS BY DAY, VENTILATOR BY NIGHT

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Introduction: Selenoprotein N-related myopathy (SEPN1-RM) is a rare congenital disorder often presenting in infancy or early childhood. Clinical sequelae frequently include progressive muscle weakness, spinal rigidity, respiratory insufficiency, and the need for nocturnal ventilatory support. Here, we describe a teenage athlete who presented with hypercarbia in the sleep lab, required tracheostomy for chronic mechanical ventilation, and was ultimately diagnosed with SEPN1-RM.
Report of case(s): We present a 15-year-old male with a remote history of scoliosis repair and obstructive sleep apnea (apnea-hypopnea index [AHI] of 11.1/hour) with subsequent tonsillectomy and adenoidectomy at age 2 years. He had done well until age 15 years when he was referred to Sleep Medicine for morning headaches and daytime sleepiness. At evaluation, he reported working a physically demanding after-school job and playing on the basketball team without any issues. Repeat polysomnography showed an AHI of 88.8/hour, hypoxemia, and hypoventilation with an average transcutaneous carbon dioxide level of 82mmHg, prompting admission to the intensive care unit for further management. After failing non-invasive ventilation due to persistent hypercarbia, he underwent tracheostomy for nocturnal mechanical ventilation. He otherwise tolerated room air during the day. Other notable work-up included evidence of pulmonary hypertension on echocardiogram, oropharyngeal collapse on bronchoscopy, and restriction on pulmonary function tests. Whole exome sequencing eventually revealed SEPN1-RM. The patient was discharged after ventilator training and continues to follow outpatient.
Conclusion: To date, there is limited understanding on the pathophysiology and clinical course of patients with SEPN1-RM. Our patient's development of severe obstructive sleep apnea necessitating mechanical ventilation, despite grossly preserved neuromuscular strength and a relatively late onset, does not follow the typical course of other pediatric neuromuscular disorders. His course adds to a small cohort of patients with this disorder and demonstrates its potentially wide clinical spectrum, suggesting further research is needed to better understand this disease process.
Support (if any): None.

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1173
UNMASKING SEVERE OSA AFTER TRANSVENOUS PHRENIC NERVE STIMULATION FOR CENTRAL SLEEP APNEA

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Introduction: In the absence of reversible etiology, central sleep apnea (CSA) may be treated with positive airway pressure (CPAP or BPAP), adaptive servo-ventilation, or supplemental oxygen. In 2017, a transvenous phrenic nerve stimulator (PNS), the remedē System™, was FDA-approved for moderate-to-severe CSA. Five-year outcomes data confirmed the device's sustained efficacy, with improvements in symptoms, apnea-hypopnea index(AHI), and central apnea index(CAI). While the device effectively treats CSA, unrecognized upper airway obstruction may hinder clinical success. This case report describes a patient whose polysomnography (PSG) suggested candidacy for PNS; however, his airway collapsibility led to severe obstructive sleep apnea(OSA), unmasked after PNS implantation.
Report of case(s): Our patient is a 74-year-old with longstanding severe CSA and chronic insomnia. He has a history of spasmodic dysphonia status post recurrent laryngeal nerve ablation. His unilateral vocal fold paralysis was followed by injection medialization for voice augmentation. He is also an asymptomatic carrier of myotonic dystrophy(MD), identified after his grandchild was diagnosed with MD. He presented to our institution for daytime sleepiness, disrupted sleep and snoring with complaints of PAP intolerance. PSG revealed an AHI4% of 49.1 events/hour with 0 obstructive apneas, 89 central apneas, and 53 unclassified hypopneas. Transthoracic echocardiogram was unremarkable. Pulmonary function tests were normal without evidence of neuromuscular weakness or extrathoracic obstruction. He underwent PNS implantation. Postoperatively, the patient continued endorsing unrefreshed sleep. His PNS titration study demonstrated prolonged flow limitation and an AHI4% of 35.2 events/hour with frequent obstructive events. He is now using a mandibular advancement device (MAD) with the PNS.
Conclusion: This case highlights the impact of upper airway collapsibility on PNS treatment response. Although our patient's history may have indicated greater susceptibility to airway collapse, preoperative PSG did not reveal unequivocal OSA. However, frequent obstructive hypopneas were unmasked after PNS implantation. This patient's upper airway collapse was underrepresented on PSG, and increased negative intrathoracic pressure during the PNS titration may have worsened the severity. Since differentiating central from obstructive hypopneas can be challenging, PNS may not be ideal for CSA patients with increased hypopnea burdens. If OSA emerges postoperatively,

adjuncts like MAD, CPAP, or hypoglossal nerve stimulation may stabilize the upper airway.
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1174
OROMANDIBULAR/FACIOMANDIBULAR MYOCLONUS; A RARE SLEEP-RELATED MOVEMENT DISORDER CAPTURED ON POLYSOMNOGRAPHY

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Introduction: Oromandibular myoclonus (OMM) also known as faciomandibular myoclonus (FMM) is a rare neurological sleep-related movement disorder characterized by involuntary and repetitive contractions of the facial muscles. Consequences of this disorder include nocturnal tongue and cheek biting, which can mimic signs of seizure disorders. This case report presents a patient with OMM/FMM which was captured on polysomnography.
Report of case(s): The patient is a 25-year-old male with a medical history that includes hypertension, obesity (BMI 67), bipolar disorder, and headaches. He presented with the chief complaint of excessive daytime sleepiness. He also endorsed waking up with a sore tongue on nearly a monthly basis without obvious reason. He underwent a split-night polysomnogram with transcutaneous CO2 (TcCO2) monitoring which showed severe obstructive sleep apnea (apnea-hypopnea index of 114.6) and sleep related hypoventilation with TcCO2 levels greater than 55 mm of Hg for more than 10 consecutive minutes. During the titration portion of the polysomnogram, several very brief (less than 250 milliseconds) stereotypical jerk-like contractions of his jaw muscles with characteristics of myoclonus were observed during REM sleep. These occurred as isolated bursts and clusters of irregular bursts of three to five repetitive contractions. Increased amplitude in the submentalis EMG leads, as well as muscle artifact in the EOG and EEG channels were identified during events. EEG showed no epileptiform findings. REM sleep atonia was otherwise preserved.
Conclusion: Oromandibular/Faciomandibular myoclonus is a sleep-related movement disorder characterized by very brief (less than 250 milliseconds) forceful myoclonus of masticatory muscles in sleep. These can occur either as isolated bursts or as a cluster of regularly or irregularly occurring brief bursts. Pathophysiology is considered to be a form of brainstem reticular myoclonus, involving a circuitry of cranial nerve V and VII nuclei along polysynaptic pathways. Tongue biting is widely recognized as a useful clinical diagnostic tool for differentiating between epileptic seizures and nonepileptic events. OMM/FMM typically presents with recurrent nocturnal tongue biting, which can be misdiagnosed as nocturnal seizures. Therefore, appropriate awareness and recognition is important to avoid an epilepsy misdiagnosis which may result in lifelong anti-seizure medication use.
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1175
ALTERNATIVE TREATMENT FOR REM-SLEEP BEHAVIOR DISORDER

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Introduction: Rapid Eye Movement (REM) Sleep Behavior Disorder (RBD) is a parasomnia occurring during REM sleep, characterized by loss of normal REM sleep atonia and dream enactment behaviors. The majority of patients diagnosed with idiopathic RBD will develop an alpha-synucleinopathy neurodegenerative disease, which can complicate the treatment of RBD. First-line treatment with high-dose melatonin or clonazepam can have side effects of daytime sleepiness, dizziness, or nightmares, which can increase risk of harm to patients. This has led some patients to seek alternative treatments. We report a patient who successfully treated symptoms of RBD with edible tetrahydrocannabinol (THC) gummies.
Report of case(s): A 67-year-old man presented to sleep clinic with symptoms of daytime sleepiness and dream enactment behavior including yelling, punching and kicking. He underwent a diagnostic polysomnogram that revealed moderate obstructive sleep apnea (OSA) but did not confirm dream enactment behavior or RSWA. He was diagnosed with RBD based on clinical criteria and started CPAP and melatonin 10 mg with initial reduction of dream enactment. At a subsequent visit he reported increased frequency of dream enactment behaviors with morning grogginess which caused him to stop melatonin and start marijuana gummies with 4.2 mg of THC purchased over-the-counter. Since starting this, his wife had reported complete resolution of dream enactment behavior.
Conclusion: Current first-line medications used to treat symptoms of RBD can cause unfavorable side effects of dizziness and daytime sleepiness which can negatively impact patients' quality of life and compound progressive symptoms of neurodegeneration. Recent studies involving cannabinoids for RBD trialed the use of Cannabidiol (CBD), but showed no reduction in frequency of dream enactment symptoms. Our case illustrates an example of successfully using THC as an alternative treatment for dream enactment behavior, which may be more well-tolerated than first-line agents and is readily available over-the-counter in many states. A possible mechanism for the improvement in symptoms may be related to THC-predominant cannabis mediated reduction in total REM sleep and REM density. More studies are needed to determine if THC can be used as a viable alternative for treatment of RBD.
Support (if any):

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1176
EXTENDED POLYSOMNOGRAPHY CONFIRMS IDIOPATHIC HYPERSOMNIA DIAGNOSES: A CASE SERIES

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Introduction: Idiopathic hypersomnia (IH) is often underdiagnosed since at least 30-40% have normal mean sleep latency tests (MSLT) and test-retest reproducibility is poor. We report two cases of IH with multiple normal sleep evaluations diagnosed at Cleveland Clinic through extended polysomnography (PSG) using a 32-hr bed rest protocol as published by Evangelista et al., 2018.
Report of case(s): Case 1: A 28-year-old female reported daytime sleepiness (Epworth Sleepiness Scale (ESS) 15), fatigue, sleep inertia, habitual sleep duration of 10-14 hr, brain fog and rare sleep-related hallucinations with symptom onset of 10 yr of age. PSG/MSLT evaluations at ages 13, 22 and 26 yr were normal,

with MSLT mean sleep latencies (MSL) of 12.9, 15 and 16.8 minutes and 0 SOREMPs after normal PSG with adequate sleep. On extended PSG, total sleep time (TST) was 19.3 hr (1155 min) on the 32-hr recording and 13.1 hr (785 min) on the 24-hr recording. Case 2: A 42-year-old female reported excessive sleepiness (ESS 22), sleep inertia, memory and attention complaints, and rare sleep paralysis associated with sleep-related hallucinations beginning in the 2nd decade of life. Habitual sleep duration was 9.5 hr. PSG/MSLT evaluations at 40 and 41 yr were normal, with MLST MSL of 14.2 and 12.8 min and 0 SOREMPs and negative urine toxicology following normal PSG with adequate sleep and nocturnal sleep of 8-8.5 hr on actigraphy. On extended PSG, TST was 19.1 hr (1147 min) on the 32-hr recording and 11.7 hr (704 min) on the 24-hr recording.
Conclusion: We report two cases with IH phenotypes, multiple normal PSG/MSLT evaluations, and debilitating symptoms for over two decades. Both met the 19-hr cutoff for the diagnosis of IH using the 32-hr bed rest protocol based on published criteria and one met the 12-hr cut-off using the 24-hr protocol. This work illustrates the limitations of current IH diagnostic criteria and underscores the need to establish more accurate diagnostic test modalities for IH given the lack of biomarkers.
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1177
THE PATIENT WHO NEVER STOPPED DREAMING
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Introduction: Sleep-related hallucination (SRH) is a parasomnia that may be encountered in the form of altered dream mentation in α-synucleinopathies, particularly in the setting of dementia with Lewy bodies (DLB). Visual hallucinations (VH) are complex, well-formed, episodes that represent a core diagnostic criterion for DLB. We report a patient who presented with REM sleep behavior disorder (RBD), VH, and perceiving the world as if he were in a persistent dream-like state coinciding with new cognitive deficits.
Report of case(s): A 74 y/o male presented with a subjective perception of "being in a constant dream-like state" for the past 2 years. He describes "atypical nightmares and hypnopompic visual hallucinations" The Patient describes that objects do not feel real, but appear drawn out as in a cartoon. He feels "disconnected" from the environment and perceives images as "distant, distorted, unreal, but also very colorful, vivid, saturated as a cartoon animation sequence. He no longer feels safe to drive and his wife reveals a failure to appreciate depth leading to an increased frequency of falls. Ophthalmologic exam was unremarkable including normal visual acuity, field testing, and color vision. ESS: 8, Sleep log: subjective total sleep- 7-8 hrs/night. Polysomnography conforms the presence of dream enactment behaviors and REM sleep without atonia meeting the diagnostic criteria for RBD. AHI-3, SaO2: 92%. REM latency: 92 minutes.
Conclusion: People with DLB experience a spectrum of sleep disorders, especially RBD, but also experience a range of sleep and wake-related complex visual hallucinations. The latter may reflect impairment in sensory integration, particularly during the transformation from mild cognitive impairment (MCI) to DLB due to alteration in visual sensory processing. Sleep clinicians serve a critical role in the evaluation of SRH, and differentiating these from other mimics, such as VH related to neuropsychiatric conditions. Due to their bizarre and perplexing presentation, visual-spatial processing disorders (VSP) in DLB may be stigmatized, dismissed, or attributed to RBD. Sleep clinicians must therefore include recognizing VSP in any patient presenting with SRH.
Support (if any):

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1178
CASE REPORT – USE OF WEARABLE OXIMETRY DEVICE TO TITRATE HYPOGLOSSAL NERVE STIMULATION SETTINGS
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Introduction: Obstructive sleep apnea (OSA) is characterized by repetitive airway narrowing or collapse during sleep. Hypoglossal nerve stimulation (HNS) is one alternative therapy. After device implantation and activation, it is patient-titrated based on symptoms. A sleep study then confirms effective settings based on an apnea-hypopnea index (AHI) below 5. Symptomatic control alone may not entail low AHI. Objective data with overnight oximetry during titration may help bridge this. We describe a patient in whom Wellue pulse oximeter was used during self-titration of the Inspire HNS.
Report of case(s): A 63 year-old male presented in June 2022 for HNS evaluation due to gasping and witnessed apneas. AutoPAP trial had failed. In November 2022 diagnostic polysomnography revealed an AHI of 18 and lowest oxygen saturation (OS) of 80%. Sleep endoscopy in February 2023 confirmed no concentric collapse at the level of the velum. He underwent HNS implantation in May 2023 and activation in June. Initial sensation and functional thresholds were 0.6 volts. Amplitude range was 0.6 to 1.6 volts, pulse width 90 microseconds, rate 33 hertz, pause time 15 minutes, electrode configuration [+,-,+], and duration 8 hours. In July, he felt 0.7 volts controlled symptoms. A Watchpat home sleep study revealed an AHI of 46.2 and lowest OS of 82%. He purchased a pulse oximeter and was shown the oxygen desaturation index (ODI) at >3%. On increasing to 1.0 volts, oximetry revealed ODI 8.65 averaged over 4 nights. At 1.1 volts, ODI improved to 0.9-4.14. Since ODI was below 5, he had subsequent in-laboratory titration, revealing at 1.1 volts the residual AHI was 2.5. The lowest OS was 89% with a mean of 95%.
Conclusion: The post-activation procedure for HNS utilizes symptom-based self-titration. Sleep studies may reveal continued apnea despite self-reported symptom control. We suspect overnight oximetry during self-titration may improve efficacy. In this case, after self-titration with oximetry to decide an amplitude setting, home and in-laboratory sleep studies confirmed effective control. This preliminarily suggests that overnight oximetry used with HNS during the self-titration phase may improve titration outcomes as confirmed by formal polysomnography.
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1179
AN UNSHAKEABLE CASE OF REFRACTORY RLS- ANDROGEN RECEPTOR INHIBITOR THERAPY AS A CAUSE OF RLS EXACERBATION
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Introduction: Restless leg syndrome (RLS/WED) is a neurological sleep condition which is characterized by an uncontrollable urge to move an individual's legs and sometimes arms when

at rest. Symptoms typically arise in the evening and nighttime hours and can be associated with severe insomnia and negative impact on quality of life. Here we present a case of severe RLS/WED exacerbations temporally associated with androgen receptor inhibitor therapy.
Report of case(s): A 58 year old male was referred to the sleep medicine clinic for refractory RLS/WED. He was previously treated with high dose ropinirole, which was associated with severe augmentation. Trials of gabapentin, pregabalin, tramadol, and hydrocodone were associated with persistence of severe symptoms. He was eventually treated with methadone at a dose of 10 mg in addition to Rotigotine patch at a dose of 2 mg, with adequate symptom relief. He was later diagnosed with prostate cancer, and initiated on enzalutamide, an androgen receptor inhibitor. Within two weeks of starting this medication, he had a severe exacerbation of his RLS symptoms and associated insomnia. The medication was discontinued, with subsequent abatement of RLS symptoms. He was then switched to apalutamide by his urologist (another androgen receptor inhibitor), but again developed severe RLS exacerbation. Dosing of the Rotigotine patch and methadone were increased to 4 mg and 12.5 mg daily respectively. In addition, he was started on pramipexole 0.25 mg, which was later increased to 0.5 mg, but he continued to have severe residual symptomatology. After discussing with his oncologist, he went on a trial of 3-4 weeks where apalutamide was discontinued. During this time, his RLS symptoms resolved, and he was sleeping well. He then restarted apalutamide and again experienced a similar a severe RLS flare.
Conclusion: Our case demonstrates an association between androgen receptor inhibitor therapy and RLS exacerbations. Further work is needed to understand the possible relationships between RLS and these common treatments for prostate cancer.
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1180

RESTLESSNESS IS A PAIN: METHADONE INDUCED AUGMENTATION

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Introduction: Characterized by a sensation of discomfort in the lower extremities during times of inactivity at night, relieved with movement, and resulting in sleep disturbances, restless leg syndrome (RLS) is a common concern addressed in Sleep Medicine. Providers are equipped with an array of effective non-medicinal and pharmaceutical treatment options including alpha-2-ligands, dopaminergic agents, and opioids. The phenomenon of augmentation is a well described complication of dopamine therapy in patients with RLS wherein symptoms intensify in severity and may spread to include the upper extremities. Here we describe an unexpected case of methadone induced augmentation in a patient with treatment refractory RLS.
Report of case(s): Our patient is a 75 year old male who initially presented to our clinic in February 2021 with concern for a >10 year history of treatment refractory RLS. Patient exhibited symptoms typical for RLS with absence of daytime symptoms, muscle cramping, neuropathy, and lower back pain. He had undergone a sleep study in 2013 which demonstrated mild sleep apnea with an AHI of 6.4/hr and periodic limb movement disorder with a PLMI of 105.9/hr. Over the last several years he had failed multiple treatment regimens including low dose lorazepam, Lyrica, Baclofen, Amantadine, and Ambien all of which were ineffective. Both Gabapentin (titrated to 600mg maximum dose) and Mirapex were discontinued due to side effects including itching and constipation/anosmia respectively. Ropinirole was discontinued due to augmentation characterized by worsening symptom severity. Ferritin levels were optimized with iron supplementation. Non-medical interventions including efforts at improved hydration, a structured exercise regimen, and reduced caffeine intake were employed without symptom improvement. He would eventually be initiated on Methadone at a dose of 10mg with marked symptom improvement over the initial 2 months; however, symptoms would once again worsen and progress to involve his arms. Patient self weaned methadone to a 2.5mg dose with good response.
Conclusion: Though previously reported with Tramadol use, augmentation is rare phenomenon outside the use of dopaminergic agents. We were unable to find other reports of augmentation in the setting of methadone use; however, our patient exhibited worsening symptom severity and progression with improvement on dose reduction.
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1181

ROCK AROUND THE CLOCK: NON-24 SLEEP-WAKE DISORDER SUCCESSFULLY TREATED WITH CIRCADIAN ENTRAINMENT, A CASE SERIES

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Introduction: Non-24-hour sleep-wake rhythm disorder (N24SWD) is a circadian rhythm disorder characterized by an inability to entrain to the 24-hour environment. It can occur in both blind and sighted individuals- usually with a longer sleep period, advanced temperature rhythm, and higher sensitivity to light than normal controls. Current therapies, derived from treating N24SWD in the blind and the human phase response curve, typically involve timed melatonin administration. It is more complex in sighted individuals, requiring multiple time cues such as light, melatonin, social interactions, feeding, and activity. We present two cases of non-24 sleep-wake disorder in sighted individuals who were successfully treated with circadian entrainment.
Report of case(s): Report of Cases: Case 1: Sighted 31-year-old unemployed male with ADHD, presented with an irregular sleep pattern. He reported a lack of routine, prolonged dim basement computer use, and a circadian rhythm appearing longer than 24 hours. Actigraphy and sleep diaries confirmed N24SWD. Comprehensive measures, including timed light and melatonin therapy, blue light blocking glasses, and activity scheduling, led to a subjective "miraculous" improvement, with follow-up actigraphy confirming resolution. Case 2: Sighted 23-year-old female with autism and affective disorders presented with shifting sleep times alternating with prolonged video-game use. Actigraphy and sleep diaries were consistent with N24SWD. Following a prescribed schedule with light therapy, timed melatonin, and activity scheduling led to circadian alignment, confirmed by sleep diaries and patient report.
Conclusion: Effectively managing N24SWD in sighted individuals is challenging, as evidenced by limited treatment success and total cases documented in the literature, including

challenges in long-term patient adherence. This case series highlights two successful instances of entrainment using a combination of timed melatonin, bright and low light therapy and activity scheduling, supported by actigraphy and diaries reflecting adaptation. These cases provide insights into contributors to the development of N24SWD and methods for resolving them.

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1182

A CASE OF HYPERSOMNOLENCE IN A SOLID-ORGAN TRANSPLANT RECIPIENT

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Introduction: Epstein-Barr virus (EBV) infects more than 90% of humans worldwide, with no evidence of active infection and persists for life. In pediatric renal transplant recipients, EBV primary infection or reactivation occur more frequently (63% and 44%, respectively). There is limited data to suggest duration of symptoms secondary to EBV and treatment options for pediatric hypersomnia secondary to EBV infection.

Report of case(s): We describe a case of hypersomnia in a 7-year-old male with ADHD. He had received a renal transplant three years prior, secondary to renal dysplasia from a deceased donor who was EBV positive. He had a baseline polysomnogram (PSG) completed for symptoms of snoring, witnessed apneas and nocturnal enuresis, and was diagnosed with severe obstructive sleep apnea. He was started on CPAP and demonstrated excellent adherence to positive airway pressure (PAP). At age 9, he developed hypersomnolence, where he would sleep for 12-16 hours a day, fall asleep in school, during meals and vacation trips. The parents reported he was diagnosed with EBV a few months prior (EBV IgG and EBV nuclear antigen positive). Completed diagnostic work up included PAP device interrogation with adherence data, an actigraphy, a diagnostic PSG while on PAP and a multiple sleep latency test (MSLT). All the work up was reassuring, except for the MSLT where the patient had a sleep onset latency of 11 minutes and 3 out of 5 naps with sleep onset REM periods. Over the course of his evaluation, his pediatric daytime sleepiness scale ranged between 20-28 (>15 is significant). He was started on atomoxetine, with some reported improvement in hypersomnolence. Repeat PSG revealed primary snoring; therefore, PAP was discontinued. At age 15, his hypersomnolence had resolved, but conversely, exhibited difficulty initiating and maintaining sleep with higher doses of atomoxetine, therefore it was discontinued after 5 years of treatment.

Conclusion: In pediatric solid-organ transplant recipients with EBV infection, it is imperative to screen for excessive daytime sleepiness in order to facilitate therapies to improve overall quality of life, as well as recognize that the excessive daytime sleepiness may be a short-term symptom.

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1183

CHASING SLEEP: CIRCADIAN RHYTHM SLEEP DISORDER - FREE-RUNNING TYPE

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Introduction: Circadian rhythm sleep disorder, free-running type (CRSD-FRT) is a disorder caused by a circadian pacemaker that is out of sync with the 24-hour light-dark cycle. CRSD-FRT is rare in sighted persons but prevalent in totally blind individuals. In sighted people, CRSD-FRT can be associated with psychiatric conditions such as depression, but the etiology remains unknown. It is postulated that sighted persons may have reduced light sensitivity for phase-resetting effects. Symptoms of CRSD-FRT include insomnia, excessive daytime sleepiness and functional impairment. Here we present a unique case of CRSD-FRT in a sighted female with a history of depression.

Report of case(s): A 27-year-old sighted female with history of depression previously treated with an SSRI presented to the sleep clinic with a chief complaint of chronic insomnia. Historically, she went to bed at 3 A.M. and awoke at 2 P.M. Sleep onset latency was normal. Estimated total sleep time was 10 hours. She denied history of any other sleep disorders. She experienced a similar delayed sleep routine as a teenager and assumed it was due to late-night gaming. She tried multiple sleep aids including trazodone, melatonin, and diphenhydramine, unsuccessfully. She described a "normal" sleeping schedule once per month, but then her sleep schedule began to move later and later, until it was normal again. She worked from home and was self-employed, giving her flexibility over her schedule. Her Epworth Sleepiness Score was 13 at the initial visit. Interestingly, her sibling had a similar sleeping pattern. Actigraphy was done which confirmed patient's diagnosis of CRSD-FRT. She was advised to start Tasimelteon.

Conclusion: The patient was previously misdiagnosed with insomnia. CRSD-FRT is rare in sighted persons and may be underdiagnosed. Our patient's CRSD-FRT may be linked to her history of depression and SSRI use. According to one study, a clinical dose of SSRI resulted in 47% increase in melatonin suppression, which increases the human circadian system's responsiveness to light. Her flexible work from home schedule may also be a contributing factor. When changing or eliminating social time cues could precipitate the development of CRSD-FRT due to variations in the length of circadian rhythm.

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1184

THE LEPTIN PUZZLE: DECODING GENES, MORBID OBESITY, SLEEP-RELATED DISORDERS AND ITS INFLUENCE

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Introduction: The role of early-onset obesity-related genetic predisposition and leptin receptor variants have been studied in previous studies. However, sleep-related disorders related to a genetic predisposition, leading to obesity, and how leptin could play a role in sleep-related disorders have been limited. In this study, we explore a case of how leptin receptor variants could play a role in the relationship between obesity and sleep-related disorders.

Report of case(s): Case of a 17-year-old Hispanic female presented with a history of frequent snoring, gasping for air while sleeping, daytime sleepiness, sleep onset, maintenance

difficulties, and limb movements at sleep. Polysomnography (PSG) was performed and later diagnosed with Obstructive Sleep Apnea (OSA). Respiratory disturbances were associated with oxygen desaturation down to a nadir of 68 % during sleep and a mean oxygen saturation of 91%, with an AHI of 22.7 events/hr. Additional genetic studies were performed to assess the causes of obesity, presenting with BBS9 heterozygous gene for a sequence variant defined as c.396GC, which is predicted to result in the amino acid substitution p.Gln132His. Furthermore, this patient is heterozygous in the LEPR gene for a sequence variant defined as c.658GA, which is predicted to result in the amino acid substitution p.Val220Ile, which has been reported in the heterozygous state in severe obesity, which increases leptin levels due to mutations in its receptor.
Conclusion: Leptin dysregulation has been associated with an increased predisposition to obesity, which could lead to sleep-related disorders, such as OSA. What is novel in our case is that our patient has an LEPR gene heterozygous variant, leading to an increase in leptin levels, a greater increase in metabolic dysregulation, and increased body weight, thus worsening her OSA. At the same time, research has shown that conditions such as OSA also increase leptin levels, which could worsen her OSA and prognosis. Further research is needed to assess LEPR and its role in OSA, especially in Hispanic populations, where research is limited.
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1185

CHEYNE-STOKES RESPIRATIONS AND CENTRAL SLEEP APNEA IN THE SETTING OF LACUNAR INFARCT: A CASE REPORT

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Introduction: Cheyne-Stokes respirations and central sleep apnea have been correlated to large areas of cerebral infarction and with smaller events such as transient ischemic attacks. Few studies and cases have analyzed and reported the association between Cheyne-Stokes respirations and lacunar infarct, an intermediary of the two extremes of cerebral events.
Report of case(s): Mr. T is an 87 year old male who originally was referred to the University of Kentucky sleep medicine clinic due to symptoms of worsening daytime hypersomnia and snoring; he had never had a sleep study. His Epworth Sleepiness Scale score was 11. Patient underwent sleep study, which found severe obstructive sleep apnea with concern for Cheyne-Stokes respirations and central sleep apnea. Medications were reviewed, none of which were contributory. With patient's history of transient ischemia attack and atrial fibrillation, work up included an echocardiogram, which showed an ejection fraction of 50-60%, CPAP titration study, which showed severe CSA, and an MRI brain, which showed evidence of old lacunar infarct. Ultimately, the patient had BIPAP S/T titration which ordered pressures of 21/13 and rate of 12. Currently patient's pathologies are well controlled, as evidenced by his last sleep study and AHI of 1.8. He continues to have some issues with leak, for which he is trialing different masks.
Conclusion: Cheyne-Stokes respirations and central sleep apnea are present in patients with history of multiple types of cerebral events. With lacunar strokes constituting 25% of ischemic strokes, it is imperative to make the correlation between Cheyne-Stokes respirations, central sleep apnea, and lacunar infarct in patients with otherwise no clear etiology of those sleep pathologies.
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1186

PHRENIC NERVE STIMULATION TO IMPROVE CENTRAL SLEEP APNEA AND QUALITY OF LIFE IN PALLIATIVE PATIENTS: A CASE REPORT

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Introduction: Central sleep apnea (CSA) is a devastating disease and occurs in approximately 40% of patients with a history of stroke, neurological conditions, and heart failure(Joseph et.al). Typical symptoms include disrupted sleep or paroxysmal nocturnal hypoxemia. The gold standard for diagnosis is polysomnography and treatment is typically positive airway pressure (PAP)(Ishikawa et. al). REMEDE stimulates the phrenic nerve transvenously, providing innovative therapeutic alternatives for patients who cannot tolerate PAP therapies(Joseph et. al).
Report of case(s): A 77-year-old male with history of advanced Parkinson's disease (PD) established with palliative care, was referred to the sleep clinic for additional management of severe central sleep apnea refractory to bilevel positive airway pressure (Bilevel PAP ST). Despite initial Bilevel PAP settings of 22/18 cm of water with a backup rate of 12 bpm, the patient faced difficulties using his machine. His apnea hypopnea index (AHI) remained in the moderate range at 18 events/hour despite PAP therapy. Attempts to adjust pressure settings, implement acclimation measures, and mask changes proved unsuccessful. Due to persistent symptoms and poor quality of life (QoL), the patient was subsequently considered for phrenic nerve stimulation, meeting inclusion criteria. Six months post-implantation, he experienced significant improvement in his reported QoL (improved mood, less sleepy during the day with improved Epworth Sleepiness scores), confirmed from his wife. Unfortunately, he passed away 11 months after implantation due to PD-related complications.
Conclusion: Phrenic nerve stimulation emerges as a novel and effective treatment for CSA, particularly for patients intolerant to Bilevel PAP therapy. This case study highlights the positive impact of phrenic neuromodulation on QoL and sleep improvement, even in patients with palliative conditions and advanced neurodegenerative diseases. Even in patients with end-stage Parkinson disease neurosurgery to replace deep brain stimulation generators is low risk(Carlson et. al). Moreover, nutrition and swallowing can be difficult in end stage Parkinson disease and there is a role for percutaneous endoscopic gastrostomy (PEG) tube to also improve QoL(Schindler et. al). We assert that methods aimed at enhancing sleep, albeit invasive and surgical, should be considered viable options for patients categorized as palliative or terminal, with the overarching goal of improving their remaining days(Lilley et. al).
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1187

NON-24-HOUR SLEEP-WAKE DISORDER IN TRANSGENDER MALE RECEIVING EXOGENOUS TESTOSTERONE

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Introduction: Little is known about the effects of hormonal therapy for adolescents undergoing transgender care. We present a case of a biologic female being treated with exogenous testosterone for transgender care who develops non-24-hour circadian rhythm disorder (N24SWD), a rare sleep-wake disorder, most commonly seen in individuals who are totally blind.
Report of case(s): A 19-year-old transgender man (female at birth) presented to our clinic with complaints of inconsistent sleep schedule and daytime sleepiness. They have a past medical history of anxiety, obsessive-compulsive disorder (OCD), and social phobia. As a younger teenager, the patient reported having a delayed sleep phase pattern. A year ago, the patient started exogenous testosterone injections every 2 weeks. Over the past year, the patient noticed a change in sleep pattern, described as going to bed and waking up 1-2 hours later, with each passing day. This was verified with 4 weeks of sleep diaries. The patient was diagnosed with N24SWD and was prescribed melatonin 0.5 mg 6 hours before bedtime without benefit. Other behavioral modifications with set wake times, bright light therapy, and morning exercises were not helpful. We prescribed tasimelteon, a melatonin receptor agonist, but it was denied by the health insurance. The current management plan is to optimize sleep behaviors and continue psychiatric follow-up for mood disorders while appealing the denial of tasimelteon.
Conclusion: Transgender individuals are particularly vulnerable to sleep disorders. Testosterone replacement therapy has been linked to sleep disordered breathing, insomnia, and sleep disruption. It has not been well established what role hormone therapy, and specifically testosterone in this case, plays on an individual's circadian rhythm. Previous studies have demonstrated that melatonin production decreases more abruptly for women going through menopause and that delayed sleep phase in teenagers may be due to hormonal changes during puberty, although pathophysiology is not fully understood5. A similar case of a transgender male receiving exogenous testosterone was recently reported. More research is needed to elucidate the potential adverse effect of testosterone replacement on the circadian rhythm of the growing population of patients undergoing transgender care.
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1188

DECREASED TOLERANCE TO HYPOGLOSSAL NERVE STIMULATOR AFTER CARDIOVERSION

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Introduction: Hypoglossal nerve stimulator (HNS) therapy is a treatment for moderate to severe obstructive sleep apnea (OSA) in patients who cannot tolerate positive airway pressure (PAP) therapy. HNS is an implanted device that stimulates tongue protrusion at the start of inspiration [1,2,3]. OSA is associated with atrial fibrillation and increased risk of recurrence after cardioversion and catheter ablation [4]. Currently, the presence of atrial fibrillation is not a contraindication to HNS implantation. However, there are accumulating reports that HNS patients requiring external cardioversion for atrial fibrillation have resulted in device dysfunction. [5]
Report of case(s): An eighty-two-year-old female with past medical history of obstructive sleep apnea with respiratory event index (REI) of 27.8 and atrial fibrillation/flutter who was implanted with HNS on 3/11/22. She was activated with configuration +-+ and functional threshold of 2.0 volts and able to increase her amplitude comfortably to 2.5V. Two months after activation, she underwent cardioversion for persistent atrial fibrillation and immediately found her stimulation intolerable. She reduced her amplitude to 1.8V and was able to gradually escalate to 2.7V. Her device was checked with no apparent malfunction. She received a second cardioversion with similar results, and again reduced her amplitude and slowly increased to 2.5V. Her subsequent titration study determined that 2.6V was ideal. Following an ablation 2 months later, stimulation was intolerable once more. Therapy was paused for 2 weeks; her amplitude was reduced to 1.4V and eventually returned to 2.0V. Follow up home study showed REI of 10.5 on 2.0V.
Conclusion: This case report highlights a rare occurrence of HNS intolerance after cardioversion. There has been one other report of device intolerance related to neurapraxia after cardioversion. The neuropraxia was believed to have been a direct effect of nerve injury related to electrical current traveling along the lead body to the electrode-tissue interface [6]. It is possible that the intolerance in our case is related to a similar mechanism. Clinicians should be aware of potential complications given the high incidence of atrial fibrillation in patients with OSA. This case may also serve as an example of how to re-introduce therapy in patients with HNS intolerance proceeding cardioversion.
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1189

INTRIGUING CORRELATION BETWEEN MELATONIN AND RESTLESS LEGS SYNDROME

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Introduction: A temporal relationship between the onset of melatonin secretion at night and the worsening of restless legs syndrome (RLS) symptoms has been described in the literature. As a frequently used adjunctive to help combat insomnia, melatonin continues to be widely used.
Report of case(s): A 65-year-old man with RLS, migraines, and onset and maintenance insomnia presented to our clinic with severe insomnia. He takes melatonin 3 mg and falls asleep in his chair while watching television. Then, he moves to the bed and has difficulty falling asleep. He will occasionally take extra doses of melatonin. He wakes up multiple times for a variety of reasons. His wake time is 4.30 AM for work. He had a home sleep apnea test that was negative. He describes crawling and achy feelings in his legs throughout the day. Sensation is associated with an urge to move or walk. These achy feelings are worse at nighttime. He currently takes 1200 mg of gabapentin three times a day. In the last year, his dose tripled despite adequate ferritin levels. Our patient did not recognize any temporal correlation between starting melatonin and worsening of his RLS but was

agreeable with stopping melatonin. Within a week of stopping melatonin, his RLS symptoms became controlled and were no longer interrupting his sleep. We continued to work on his sleeping habits.
Conclusion: This case adds to increasing evidence of a correlation between melatonin and RLS. No substantial evidence was found during our literature search. One theory suggests that melatonin can inhibit dopamine release by suppressing calcium influx into stimulated nerve endings. Considering the widespread use of melatonin and the detrimental effect of RLS on quality of life, more studies are needed to evaluate this hypothesis.
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1190

PERIODIC LIMB MOVEMENT DISORDER MASKED BY CONCURRENT FOCAL AWARE SEIZURES

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Introduction: Sleep disorders such as sleep apnea and sleep-related movement disorders are more common in patients with epilepsy compared to the general population. Complex rhythmic motor events related to periodic limb movement disorder (PLMD) can overlap with the hypermotor phenomenon of nocturnal seizures, making it a challenging diagnosis solely based on clinical description. The recognition of these repetitive stereotypical movements from seizures would be essential to guide targeted therapy.
Report of case(s): We report a patient with focal aware seizures who concurrently experienced sensory symptoms typical of restless leg syndrome (RLS) as her ictal symptoms, as well as paroxysmal nocturnal motor symptoms meeting the diagnostic criteria of PLMD. A 51-year-old right-handed female presented with two years of seizures and nocturnal episodes primarily characterized by creepy crawly feeling in both her upper and lower extremities as well as her trunk with intact awareness. The patient also endorsed non-restorative sleep and daytime sleepiness. During an admission to the epilepsy monitoring unit, several habitual events were recorded that were consistent with fronto-temporal seizures. Interestingly, the majority of her ictal events started with the same creepy crawly sensation. Blood count, serum chemistry, and liver and renal function tests were unremarkable, except for very low serum ferritin levels (4.5 ng/ml) which, in combination with her sensory symptoms raised suspicion for PLMD. Subsequent polysomnography (PSG) showed mild OSA (AHI 9.8/h) and moderate to severe PLMD (43 events/h). Symptoms improved after iron supplementation along with better seizure control (adding lamotrigine to her levetiracetam). A repeat ferritin improved to normal range (46 ng/ml).
Conclusion: Our case demonstrates that clinical presentation of RLS/PMLD can be indistinguishable from the primary seizure semiology. RLS/PLMD can be a consideration in patients with epilepsy complaining of sensory ictal semiology as seen in this case and may warrant further work-up.
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1191

A PEDIATRIC CASE OF TREATMENT EMERGENT CENTRAL SLEEP APNEA DURING HIGH FLOW NASAL CANNULA POLYSOMNOGRAPHY

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Introduction: High flow nasal cannula (HFNC) is an alternative therapy to continuous positive airway pressure (CPAP) in pediatric populations with behavioral intolerance or contraindications to CPAP. Studies evaluating HFNC as a treatment modality in the pediatric literature have been limited.
Report of case(s): A previously healthy 12-year-old male with a history of obesity presented with partial and full thickness burns to his face, neck, chest, and bilateral upper-extremities following a bonfire accident. His burns covered 15% of his total body surface area. He required hospitalization for acute burn management and skin grafting. During his hospitalization, he was observed to have snoring, witnessed apneas, and nocturnal hypoxemia concerning for underlying obstructive sleep apnea. He was unable to utilize a non-invasive positive pressure mask interface due to his extensive facial dressings and pressure sensitive skin grafts. He was discharged home on high flow nasal cannula at 10-15 Liters/minute. The patient experienced weight gain following hospitalization, possibly related to Cyproheptadine use for burn-related itching. Approximately 10 months after discharge, the patient underwent split-night HFNC polysomnography. The diagnostic portion of his study revealed severe obstructive sleep apnea with an OAHI of 28.8 events/hour. There were no observed central or mixed respiratory events and no REM stage sleep during the diagnostic portion of the study. After initiating HFNC at 40 L/minute and 34 degrees Celsius per sleep laboratory protocol, the OAHI decreased to 0.0 events/hour despite REM rebound, and the CAHI increased to 16.8 events/hour. This study was conducted at approximately the same altitude as the patient's home.
Conclusion: This patient experienced treatment emergent central sleep apnea during HFNC polysomnography. Treatment emergent central sleep apnea with HFNC has previously only been described in a limited number of pediatric patients with underlying chronic lung disease, developmental delay, or genetic syndromes. This case highlights HFNC as an alternative treatment modality to CPAP as well as the need for further understanding of HFNC titration in pediatric sleep laboratories.
Support (if any): The Breathing Institute at Children's Hospital Colorado

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1192

A CASE OF WORSENING EXPLODING HEAD SYNDROME WHEN USING POSITIVE AIRWAY PRESSURE

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Introduction: Exploding head syndrome (EHS) is a rare parasomnia with unclear etiology. There are limited research studies to confirm the exact predisposing and precipitating factors for its onset and frequency. Some published case reports suggest symptomatic improvement with the treatment of comorbid obstructive sleep apnea (OSA). This case presents a patient who received automatic positive airway pressure (APAP) treatment for OSA with worsening EHS symptoms.
Report of case(s): A 41-year-old male with obesity (BMI of 33) and chronic back pain complained of visual and audio sensations of explosion, vibration, and light when falling asleep and waking up in the middle of the night without any associated physical pain. These events would occur twice a month and were accompanied by waking up three to four times nightly due to loud snoring. A home sleep study (HSAT) was completed and consistent with mild obstructive sleep apnea, demonstrating a respiratory event index (REI) of 7.4 events per hour. The patient was diagnosed with exploding head syndrome and OSA. He was started on APAP therapy. At the six-week follow-up, he noted worsening frequency of EHS events to twice a week. During this time, he lost his job. At the three-month follow-up since starting APAP, he reported further worsening of his EHS episodes to three times a week. The patient was not compliant with APAP usage. The compliance data revealed average usage of 2-3 hours a night with residual AHI of 1.2/hour.
Conclusion: EHS is a rare disorder with unknown predisposing and precipitating factors. This patient noted worsening of his EHS after the initiation of APAP therapy for his obstructive sleep apnea. However, the patient was not fully compliant with PAP therapy. He also underwent further stressors during this period. This case raises consideration regarding the side effects of APAP therapy on the severity of EHS when treating OSA.
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1193

OXYCARDIORESPIROGRAM? MORE THAN A FANCY WORD, AN ALTERNATE WAY TO DETERMINE RESPIRATORY SUPPORT IN A COMPLEX INFANT

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Introduction: Obtaining diagnostic cardiorespiratory data via a polysomnogram in extremely young infants can be challenging. A multi-channel oxycardiorespirogram (OCRG) can be used to evaluate cardiorespiratory status in infants during wake and sleep states. The study records heart rate and rhythm, respiratory rate, oxygen saturation, and chest wall movement over a course of 4-8 hours. During the study, supplemental oxygen may be provided and adjusted according to the patient's needs. We present a case of an infant in which the OCRG was able to guide the amount of respiratory support as an alternate diagnostic tool.
Report of case(s): Patient is a 2-month-old female born at 35 weeks gestation with prenatally diagnosed myelomeningocele, hydrocephalus (s/p ventriculoperitoneal shunt placement), absent cerebellum, and marked hypoplasia of the brainstem. She was admitted to NICU on room air and then developed frequent episodes of apnea associated with desaturations requiring escalation of respiratory support to intubation with mechanical ventilation. She was gradually weaned to high flow nasal cannula of 2 liters per minute (LPM). Capillary blood gas (CBG) at baseline was normal. A multi-channel OCRG to better characterize her apneic events was ordered. Apneas occurred most frequently during sleep and were associated with oxygen desaturations. Independent episodes of desaturations occurred during feeds and during sleep with an oxygen nadir or 86% and 75%, respectively. The frequency of the apneic/desaturation events improved with 0.5LPM supplemental oxygen given via conventional nasal cannula (NC). With these results, we recommended that she be discharged home on 24 hour supplemental oxygen support of 0.5LPM NC. At subsequent outpatient pulmonary clinic visits at 1-2 month intervals, the OCRG study recorded a decrease in frequency of the apneic episodes associated with desaturations over time. We have been able to wean her daytime supplemental oxygen use to 0.25LPM NC and keep the nighttime supplemental oxygen the same.
Conclusion: Our case highlights the importance of considering alternative diagnostic and monitoring techniques such as a multichannel OCRG to determine supplemental oxygen respiratory support needs for patients who have frequent apneic episodes in both awake and sleep states in the neonatal and infant period.
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1194

A CASE OF UNSUCCESSFUL POSITIVE AIRWAY PRESSURE TITRATION

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Introduction: Oronasal masks are commonly used interfaces when treating obstructive sleep apnea (OSA). Masks modalities are often chosen based on patient preference and comfort however, oronasal masks may cause worsening of OSA in some individuals.
Report of case(s): An 83 year old male presented for snoring, witnessed apneas, and daytime somnolence. A split-night PSG was ordered for evaluation. During the diagnostic portion of the study, the patient exhibited moderate OSA with an apnea hypopnea index (AHI) of 27/hr. The titration portion of the study was initiated with an oronasal (full face) interface. Continuous positive airway pressure (CPAP) pressure was titrated from 5cm H2O to 15 cm H20 with worsening of obstructive events and a residual AHI of 21 to 40/hr. Bilevel positive airway pressure (BiPAP) was then initiated and titrated from 19/15 cm H2O to 21/17 cm H20 with a continued residual AHI of 40/hr. No central apneas were noted. Upon review, suspicion arose whether the oronasal mask exacerbated the patient's OSA. A repeat titration PSG was conducted with a nasal mask. With this mask a pressure of 8cm H20 resulted in a residual AHI of 0/hr. The patient was prescribed APAP 6-10 cm H20 with a nasal mask which resulted in excellent compliance and a residual AHI of 3.6/hr.
Conclusion: This case report presents a patient with worsening OSA due to use of an oronasal interface. Prior studies have suggested that oronasal masks produce less retropalatal airway opening than nasal masks. There may also be an effect on anterior-posterior distance of the mandible in the setting of exhalation. When possible, oronasal masks should be avoided in lab or home titration studies as they may lead to worsening OSA leading to escalation of PAP pressures and/or adjustment in titration modality.
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1195

SLEEP-RELATED HALLUCINATIONS

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Introduction: Sleep-related hallucinations, encompassing visual and auditory experiences pose a complex clinical challenge. Here, we illustrate 2 cases with diverse underlying etiologies.
Report of case(s): Case 1: 76-year-old male with 3 months of nocturnal visual hallucinations, occurring 3-5 nights per week. These ranged from familiar and unfamiliar faces and characters reminiscent of movies. Symptoms occurred when waking up in the middle of the night, with difficulty returning to sleep. Polysomnography (PSG) unveiled moderate obstructive sleep apnea (OSA) without findings indicative of parasomnias and no symptoms on the night of PSG. Brain MRI revealed chronic infarcts involving right basal ganglia and bilateral optic radiations. Lesions of structures that commonly cause visual hallucinations (optic lens, retina, thalamus, midbrain) were absent. The frequency of episodes decreased to 1-2 per month after initiating CPAP therapy. Potential mechanism of improvement could be PAP mediated optimization of perfusion to the ischemic penumbra. Case 2: 93-year-old male with an eight-year history of insomnia due to musical hallucinations (MH). Auditory experiences included church and semi-classical music, with 80% being familiar tunes. The patient, a former church choir member, has a history of progressive hearing loss and tinnitus. Brain MRI/MRA revealed chronic periventricular microvascular ischemic changes. Extended EEG showed no evidence of seizures. Audiometry confirmed moderate-severe bilateral sensorineural hearing loss. No response was seen to Levetiracetam, Gabapentin, Donepezil and behavioral therapy. Home sleep study revealed severe OSA. CPAP therapy did not result in improvement of MH. MH improved significantly with Lorazepam. Hypoacusis, psychiatric disorders, focal brain lesions, epilepsy and intoxication are common etiologies for MH. The etiology in this case is very likely due to hypoacusis. The hypothesis is deafferentation resulting in release phenomenon or spontaneous activity in the auditory pathway, manifesting as MH.
Conclusion: Sleep-related and nocturnal hallucinations warrant a comprehensive evaluation. Differential diagnoses include neurological causes, including stroke, seizure, Multiple Sclerosis, tumor, vascular lesions, and neurodegenerative disorders. Other etiologies include psychiatric disorders, medications, alcohol, otologic and ophthalmic pathologies. It is also reasonable to evaluate for comorbid OSA as appropriate treatment may decrease the frequency of episodes and improve overall sleep in some patients.
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1196

USE OF HOME SLEEP APNEA TESTING TO INVESTIGATE PERSISTENT HYPOXIA IN THE REMOTE SETTING

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Introduction: Nocturnal oxygen titrations can be resource intensive, and often require the patient to undergo an attended polysomnogram (PSG). Veterans who live in remote areas are often reluctant to undergo PSG, particularly in those with multiple medical comorbidities that prohibit prolonged travel. We present a case of a veteran with severe OSA and persistent nocturnal hypoxia who underwent a remote oxygen titration using home sleep apnea testing (HSAT) equipment.
Report of case(s): 79-year-old male with history of hypertension and diabetes diagnosed with severe OSA (AHI 38 events/hour), with significant oxygen nadir of 65%. He was prescribed automatic positive airway pressure (APAP) of 6-16 cmH2O and a follow up 3-night oximetry was ordered which showed persistent nocturnal hypoxia. Remote monitoring showed regular PAP use with AHI < 5/hr during the nights of oximetry. Unfortunately, the patient was unable to travel for attended PAP and oxygen titration study for further diagnostic assessment. It was instead decided to repeat 3-night oximetry with use of supplemental oxygen (1, 2, 3 liters/minute for nights one, two, and three respectively). Results again showed persistent nocturnal hypoxia with AHI < 5/hr on remote data monitoring. 3-night HSAT connected to the patient's APAP device was ordered, with bleed in oxygen at 2, 3, and then 4 liters/minute over the consecutive nights of the study. Results included the C-flow channel, which surprisingly showed persistent snoring and obstructive events (average AHI of 8/h) despite APAP, a discordant finding to that on remote data monitoring. The decision was made to transition patient to an automatic bilevel positive airway pressure mode with two-liter oxygen bleed in. This resulted in adequate treatment of OSA and nocturnal hypoxia as confirmed by follow up HSAT. It is notable that ongoing diagnostic evaluation of hypoxia is underway.
Conclusion: Aside from its promise in diagnosing moderate to severe OSA, HSAT over oximetry alone may provide additional diagnostic information (C-flow channel) in patients with residual nocturnal hypoxia despite PAP. In patients who are not able to undergo formal attended titration studies such as those who live in remote settings, this is a potential alternative.
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1197

CATAPLEXY - MANAGEMENT CONUNDRUMS

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Introduction: Creating a guideline for the management of patients with narcolepsy is complex due to the number of potential mechanisms that could account for the increased risk of perioperative complications: aggravation of narcolepsy itself, dysautonomia, narcolepsy-related medications, anesthesia interactions, etc.
Report of case(s): An 80-year-old woman with a history of narcolepsy type 1, depression, restless leg syndrome, obstructive sleep apnea, and atrial fibrillation presented to our sleep clinic to establish care. Her narcolepsy was managed with strategic naps, but no medications. She had previously experienced rare episodes of cataplexy, described as the inability to talk, and syncope. While on anticoagulation for her atrial fibrillation, she sustained a fall during an episode of cataplexy

resulting in brain bleed and eye loss, which prompted her to start pitolisant. Subsequent polysomnography showed an apnea-hypopnea index of 72/hr with nadir oxygen of 74%, requiring Adaptive Servo-Ventilation (ASV), which she did not tolerate. She noted cognitive decline and extreme weakness resulting in hospitalization, during which neurology reported frequent myoclonic jerks and excessive sleepiness. Given her untreated sleep apnea, we recommended re-initiation of ASV during the inpatient hospital stay, which improved her symptoms significantly. She subsequently developed an unrelated need for urgent bowel surgery, necessitating cessation of oral intake, which was temporally related to debilitating and refractory cataplexy. Following recovery from this acute hospitalization, she recovered and was again seen in the clinic, with no further episodes of cataplexy and improved sleepiness in the setting of ASV compliance and resumption of her pitolisant.

Conclusion: This case emphasizes the importance of controlling even rare cataplexy in the setting of potentially catastrophic outcomes. It also raises concerns about the management of narcolepsy with cataplexy in the perioperative period, which currently lacks quality data and guidelines.

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1198

ACUTE ONSET VISION LOSS IN A PATIENT WITH NAION AND OSA

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Introduction: Non-arteritic anterior ischemic optic neuropathy (NAION) is the most common optic neuropathy in middle-aged and older-aged adult. There are an estimated 6000 new cases per year and is most commonly diagnosed in patients between 61-72 years of age. It affects men and women equally. There is a slightly higher incidence in white patients. 55-59% of patients with NAION also have OSA.

Report of case(s): A 51-year-old man with a past medical history of hypertension and erectile dysfunction developed painless left inferior altitudinal visual field loss and blurriness in April 2023. He was seen in the Ophthalmology Department and was found to have left unilateral optic disc swelling on fundoscopic examination. An MRI of his brain, orbits, and face were normal. He was referred to Neuro-Ophthalmology where a slit lamp and fundus exam was performed and was significant for 360 degrees of disc swelling with heme seen inferiorly and normal appearing vessels and macula. A follow up fundoscopic examination one month later was significant for a hyperemic nerve and nasal blurriness in the left eye. No changes were seen in the right eye. Based on these findings, he was diagnosed with NAION. A HST was ordered by his Ophthalmologist that showed moderate OSA with an AHI of 24.3/h, an O2 nadir of 81%, and an ODI of 32.3. He was then seen in the Sleep Medicine clinic and prescribed CPAP. At his two month follow up appointment, he had an improvement in his daytime sleepiness and concentration but still had residual visual deficits in his left eye, including blurriness, light sensitivity, and difficulty focusing.

Conclusion: NAION is a rare condition with untreated OSA as a known risk factor due to nocturnal hypoxia decreasing perfusion to the optic nerve. This case reinforces the notion that the hypoxic burden of untreated OSA is a systemic problem and can lead to damage throughout the body. In this case, the benefit of treating this patient's OSA is that his contralateral eye, the right eye, is also vulnerable to developing the same ischemic optic neuropathy that the left eye suffered from.

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1199

A NOVEL APPROACH TO REM SLEEP BEHAVIOR DISORDER SAFETY MEASURES

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Introduction: Rapid Eye Movement (REM) Sleep Behavior Disorder (RBD) is a parasomnia occurring during REM sleep, characterized by loss of normal REM sleep atonia and dream enactment behaviors. Behaviors include yelling, punching, kicking, and complex or violent movements causing a fall out of bed and result in injury to the patient or their partner. The American Academy of Sleep Medicine recommends maintaining a safe environment for patients. For patients with uncontrolled severe symptoms, recommendations include having partners sleep separately from patients. This may not be practical for small living spaces, may result in loss of intimacy between partners, or delay response to injuries caused by RBD. We present the case of a patient devised novel approach to keep their partner safe while maintaining close-proximity while sleeping.

Report of case(s): A 63-year-old man with a past medical history of moderate obstructive sleep apnea (OSA) on CPAP presented to sleep clinic with symptoms of dream enactment. Behaviors included yelling, punching, and kicking. He had kicked his wife and had fallen out of bed resulting in an injury. He underwent a polysomnogram that showed REM sleep without atonia and was diagnosed with RBD. He was advised on safety precautions and started high dose melatonin. Clonazepam was added, but symptoms were not eliminated. He and his wife did not want to sleep separately, so he pushed two twin beds together and separated them with a large sheet of plexiglass. He reported he had hit the plexiglass many times without inuring himself and prevented injury to his wife. The patient's wife was able to safely sleep near him which helped maintain their sense of intimacy.

Conclusion: We report a novel approach to create a safe environment for patients with RBD while maintaining partner proximity and intimacy. As patients struggle with progressive neurodegenerative disease, it is important to have their partners nearby overnight when patients are at risk for falling and self-injury. With two twin beds separated by plexiglass, a patient can safely sleep next to their partner and significantly reduce the risk of injuring them. This may be a useful technique for patients with severe, refractory symptoms of RBD.

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1200

OVERSTIMULATED: A CASE OF HYPOGLOSSAL NERVE STIMULATOR OVER-TITRATION

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Introduction: Hypoglossal nerve stimulation (HNS) is an effective treatment for obstructive sleep apnea (OSA) that stimulates nerves that protrude the tongue and move the hyoid bone anteriorly to restore airway patency during sleep. After implantation, the stimulator voltage is titrated to an optimal therapeutic level. We describe the case of a patient whose OSA was effectively treated at a lower voltage and then demonstrated worsening sleep apnea after over-titration to a higher voltage.
Report of case(s): A 37-year-old healthy man with a body mass index of 32 kg/m2 presented with snoring. A polysomnogram revealed an apnea hypopnea index (AHI) of 53.9 events per an hour consistent with severe OSA. He was intolerant of continuous positive airway pressure (CPAP) and trial of a mandibular advancement device (MAD) was ineffective. The patient subsequently underwent hypoglossal nerve stimulator implantation without complications. After an appropriate healing period, his device was activated with a noted functional amplitude of 0.8V and an allowed range of 0.8V to 1.8V. During self-titration, the patient noted improvement of snoring and apneas at an amplitude of 1.6V. However when he increased the amplitude further he noted recurrence of his OSA symptoms. He underwent an attend polysomnography titration study that revealed an estimated AHI of less than 10 with his HNS set to 1.6V representing an appropriate treatment response. However, when his HNS was titrated up to 1.7V, his estimated AHI increased to 26.4 consistent with moderate OSA. The patient's device was set to a voltage of 1.6V.
Conclusion: HNS is an important treatment option for patients with OSA who are intolerant of CPAP. After implantation, attention must be given to careful titration of the stimulation voltage during an attended polysomnogram to avoid over titration which can lead to an increased number of obstructive events in some patients. While the mechanism of this phenomenon is currently unknown, theoretical mechanisms include stimulation of the lateral division of the hypoglossal nerve triggering tongue retraction at higher voltages and genioglossus muscle fatigue.
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1201

A DROWSY DEPLOYMENT DILEMMA: CASE REPORT OF A MILITARY DEPLOYMENT-INDUCED KLEINE-LEVIN SYNDROME EPISODE

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Introduction: Kleine-Levin syndrome (KLS) is a rare central disorder of hypersomnolence that typically develops in adolescent males and is accompanied by behavioral and cognitive disturbances such as altered perception or disinhibited behavior. The underlying etiology of this disease is unknown. It has a benign clinical course that often resolves after a median of fourteen years.
Report of case(s): A 24-year-old male with an unremarkable past medical history was deployed by the United States (U.S.) Air Force to Africa. Patient had an episode of extreme hypersomnolence during his deployment associated with hearing abnormalities, anterograde amnesia, and irritability. He endorsed sleeping 20 hours straight – only waking to eat and use the restroom. He ultimately required medical evacuation to Germany. In Germany, he had an unremarkable neurology evaluation, laboratory studies, electroencephalogram (EEG), and brain magnetic resonance imaging (MRI). Upon further questioning, the patient's first episode occurred three years ago without an identifiable trigger. Subsequent episodes lasted 1-4 weeks and recurred every 3-4 months. He was asymptomatic between episodes. Upon returning to the U.S. the patient was evaluated by sleep medicine, and a clinical diagnosis of KLS was made. The following day, the patient returned to the sleep center escorted by his work supervisor with an acute onset of hypersomnia. A multiple sleep latency test (MSLT) was performed with modifications (no polysomnography (PSG) or actigraphy prior and four naps). The patient demonstrated a mean sleep latency of 12 minutes and 37 seconds, which does not meet criteria for hypersomnolence. The patient was sent home after the MSLT with actigraphy for 2 weeks. He did not wear the device enough to allow for interpretation.
Conclusion: This is the first case report describing a military deployment-induced KLS episode. KLS is a clinical diagnosis of exclusion that does not require objective confirmation. The majority of available KLS literature states that objective measurements, such as MSLT and PSG, are not useful for diagnosis. However, KLS studies have limitations due to rarity of disease and lack of testing during episodes. We propose that the diagnostic criteria for KLS be re-evaluated to include objective data such as MSLT.
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1202

WORSENING OF OBSTRUCTIVE SLEEP APNEA FOLLOWING RESECTION OF A VAGAL NERVE SCHWANNOMA

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Introduction: Schwannomas (SN) arising from the vagus cranial nerve (CN X) are uncommon (2–5%) benign nerve tumors. SN may promote obstructive sleep apnea (OSA) when parapharyngeal schwannoma narrows the airspace or as a direct result of injury to the recurrent laryngeal nerve which leads to vocal cord paralysis. We present an unusual presentation of worsening OSA in a patient who presented with CNX SN, underwent resection of the tumor, and developed unilateral vocal cord paralysis.
Report of case(s): A 47-y/o male with a history of mild OSA s/p UPPP, presented with a new neck mass, worsening snoring, apneic episodes, fragmented nocturnal sleep, and worsening hypersomnolence. He was diagnosed with CN X SN and underwent left modified radical neck dissection for removal of a left-sided carotid mass which extended to the distal branches of the recurrent laryngeal nerve (RLN). Postoperatively, the patient exhibited dysphonia, dysphagia, and severe gasping at night attributed to left-sided vocal cord paralysis (VCP). Baseline Polysomnography (PSG) at age 32 before UPPP: AHI: 9 (REM:15, Supine: 18), SaO2: 89%. PSG following SN resection: AHI: 42 (REM: 21, Supine: 42), SaO2: 77%. The patient was prescribed autoPAP which resolved his symptoms.
Conclusion: The literature provides evidence of iatrogenic VCP, as a significant contributor to OSA. To our knowledge, this is the first report of VCP linked to SN of CN X. Multiple mechanisms may contribute to the OSA in our patient. (1) Resection of the CN X SN complex, including

the distal branches CN X which lies near the RLN and may have been severed resulting in unilateral VCP and ultimately airflow limitations. (2) Resection of the CN X SN complex may have also altered neuronal pathways originating in the respiratory control centers in the brainstem. This mechanism, while somewhat elusive, highlights the potential role of vagal sensory innervation of the respiratory tract and provides fundamental insights into how derangement of afferent neuronal control modulated through CNX contributes to disorders of respiratory control.
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1203
WHEN THE OPTIONS RUN OUT… LESS IS MORE… A CASE OF PEDIATRIC NARCOLEPSY WITH LIMITED TREATMENT OPTIONS

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Introduction: We report a pediatric patient with Narcolepsy Type 1 with significant daytime impairment who faced challenges with the standard treatment options of pediatric narcolepsy.
Report of case(s): The patient is a 16 year old female with confirmed diagnosis of narcolepsy type 1 (mean sleep latency < 5 minutes, 4 sleep onset REM periods). Her symptoms (excessive daytime sleepiness (PDSS 26), cataplexy, hypnagogic/hypnopompic hallucinations and depression) gradually started at the age of 12 years of age and worsened overtime. Cataplexy initially involved eye and facial twitching that were triggered by laughter or anger which gradually progressed to generalized loss of tone. As the initial management of narcolepsy, she was started on atomoxetine with no change in symptoms. She transitioned to methylphenidate which improved her daytime sleepiness minimally but with no improvement of the cataplexy. Due to further adverse effects with stimulants, she started sodium oxybate with low dose dextroamphetamine. Initially, the combination improved wakefulness but then with dose titration, the patient developed severe depression and suicidal ideation after 8 months of use. She also demonstrated manic episodes and anorexia. With each treatment regimen, her depression and anxiety vacillated in severity. Lastly, a trial of pitolisant was titrated to 13.35 mg. She developed heart palpitations with the higher doses, so low dose Pitolisant 8.9 mg daily was continued. At this dose sleepiness improved, with some improvement in functionality. Venlafaxine 225 mg daily was added to the regimen to control cataplexy and depression with good benefit. With the low dose pitolisant and venlafaxine combination, she has been able to participate in extracurricular activities at school.
Conclusion: Pediatric narcolepsy can be challenging to treat as there are limited treatment options. We presented a case of a teen who had multiple symptoms of narcolepsy with coinciding depression and anxiety. Despite multiple drug regimens, her symptoms improved with off label use of Pitlosant , interestingly at low dose. Although clinical manifestations of pediatric narcolepsy may be life altering for the patient, close clinical follow up is imperative to screen for adverse effects after implementing a treatment plan.
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1204
IMPORTANCE OF ARM ELECTROMYOGRAPHY FOR REM WITHOUT ATONIA DETECTION

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Introduction: Dream enactment raises concern for rapid-eye movement (REM) sleep behavior disorder (RBD). RBD is a parasomnia during which the patient has loss of normal atonia during REM sleep. RBD is highly associated with α-synucleinopathies (i.e., Parkinson disease, dementia with Lewy bodies, and multiple system atrophy) and can precede additional neurodegenerative signs and symptoms. REM sleep without atonia (RWA) is demonstrated through electromyography (EMG) during polysomnography. RWA requires the presence of tonic/sustained activity with ≥50% of the epoch containing excessive chin activity or phasic/transient muscle activity in ≥5 mini-epochs of 3-second duration in a 30-second epoch. We present a case that highlights the necessity of ordering polysomnography with arm EMG when evaluating for RBD.
Report of case(s): A 73-year-old man presented to the clinic for concern of obstructive sleep apnea. He was also evaluated by neurology and given a diagnosis of essential tremor. During the initial visit, he also reported frequent "night terrors," which he later described as dream enactment. His medications included metoprolol but no antidepressants; however, the dream enactment started prior to beta-blocker use. His physical exam was notable for right cogwheel rigidity, mild decrease in right serial finger tapping and rapid alternating movements, and mild dysphonia. A polysomnogram with arm EMG was ordered. On polysomnography, RWA was present in multiple epochs that was seen predominantly with arm (flexor digitorum superficialis) EMG. The RWA index (% of REM sleep meeting criteria for RWA) using the leg (anterior tibialis) and chin EMG was only 5%; however, the RWA index with the addition of arm EMG increased the RWA index to 64%.
Conclusion: The presence of RWA on PSG with dream enactment behavior gives this patient the diagnosis of RBD. While leg EMG is a part of routine PSG, arm EMG is not and needs to be specifically requested. Although research supports the use of arm EMG leads, we commonly find the addition of arm EMG leads is not ordered by providers when assessing for RBD. Arm EMG increases the chance of observing RWA and can be of strong importance to solidify an RBD diagnosis.
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1205
HAUNTED SLUMBERS: DECODING A TRAUMA-INDUCED SLEEP DISORDER IN A TEEN PATIENT

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Introduction: This case examines a complex inpatient sleep presentation of a teenager with a history of foster care, depression, anxiety, PTSD, and ADHD, presenting with features of parasomnia. Key symptoms included excessive sleepiness, waking

hallucinations, partial awareness, and significant uncontrolled movements reaching a level of severity requiring hospitalization.
Report of case(s): A 14-year-old female presented with severe nocturnal episodes arising from sleep characterized by hallucinations of a dark figure, observed limb thrashing, screaming, and impaired arousal that gradually intensified over a 5 month period. Despite treatment for PTSD and an SSRI, her condition worsened - escalating to a severe and prolonged episode requiring EMS and hospitalization for her intense, potentially harmful movements. Concerns of parasomnia prompted inpatient sleep medicine consultation. Detailed history indicated these spells occurred primarily in early morning hours during sleep-wake transitions, with the patient having only partial recall of her movements. Each episode involved fear and visual hallucinations of threatening figures that she could recall later. Significant sleep disruption and daytime sleepiness were noted. Her psychiatric history revealed trauma from foster care. She also reported a fascination with horror media which seemed to influence these disturbances, reflecting in recurrent nightmares and similar traumatic experiences. Video EEG was negative for seizure disorder; PSG showed very mild OSA, REM with appropriate atonia, and sudden brief awakenings in both NREM and REM sleep. No spells were observed. Due her parents safety concerns, she stayed in a residential facility for intensive outpatient psychiatric therapy. Her episodes gradually improved with sleep scheduling, optimization of medications, and counseling. In outpatient therapy, she reported a swift cessation of the episodes, marked by her intentional disregard of the hallucinatory figure from her experiences.
Conclusion: This case highlights trauma-induced sleep disturbances in a young patient requiring hospitalization and inpatient sleep medicine consultation. The resolution of symptoms with changes in medication, improved sleep duration and hygiene in a residential setting underscores the importance of a comprehensive approach to managing complex sleep spells in adolescents with mood disturbance.
Support (if any):

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1206
COMBINATION OF NASAL STEROID AND NASAL OXYMETAZOLINE: A WAY TO IMPROVE PAP TOLERANCE IN OSA PATIENTS WITH RHINITIS

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Introduction: Obstructive sleep apnea (OSA) is the most common cause of sleep-disordered breathing, and positive airway pressure (PAP) therapy is the gold standard for treatment. PAP therapy adherence remains a challenge especially in patients with nasal disease. Our case is that of a patient with OSA and long-standing allergic rhinitis who had significant improvement in PAP adherence with the use of daily intranasal oxymetazoline and fluticasone.
Report of case(s): A 62-year-old man with history of allergic rhinitis on intranasal fluticasone presented to our sleep clinic for discussion about OSA treatment options because he was intolerant of PAP therapy. He had OSA documented for 18 years and had twice attempted PAP therapy unsuccessfully despite high motivation. Baseline AHI was 25/hr. He had tried a mandibular assist device (MAD) with good control of snoring until he gained more weight and the MAD no longer controlled symptoms. He attempted PAP therapy again and tried nasal oxymetazoline with a nasal steroid and was able to tolerate the use of PAP machine for an entire night and so continued using the combination therapy. He has been tolerant of PAP for a year on this regimen without the development of rhinitis medicamentosa (RM). The presence of rhinitis before or after starting PAP therapy is a strong negative predictor of PAP adherence. Intranasal oxymetazoline is an option for treatment of sinusitis but has been known to cause rhinitis medicamentosa when used alone. Our index patient did not notice any improvement in tolerance of PAP while on intranasal fluticasone, but a combination of intranasal fluticasone and oxymetazoline led to better tolerability in our patient. There are limited studies for long-term use of oxymetazoline. Two studies showed that using oxymetazoline along with a nasal steroid once daily for 4 weeks demonstrated improved effectiveness in relieving nasal symptoms with no development of rebound congestion or rhinitis medicamentosa.
Conclusion: PAP therapy compliance remains a challenge in patients with allergic rhinitis. Combination therapy of intranasal steroid and intranasal oxymetazoline may be helpful in improving PAP adherence in these patients, and further study is warranted.
Support (if any):

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1207
INTERCOSTAL MONITORING AS A NOVEL APPROACH TO POLYSOMNOGRAPHY DURING HYPOGLOSSAL NERVE STIMULATOR TITRATION

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Introduction: Hypoglossal nerve stimulation is an alternative treatment modality for patients with obstructive sleep apnea who are not able to achieve ideal compliance rates with PAP therapy, and is becoming more widespread, with growing numbers of patients considering and undergoing implantation. Protocol for the only commercially available hypoglossal nerve stimulator (HNS) in the US includes a follow up titration polysomnogram (PSG) after implantation for device adjustment. This is typically performed using a standard PSG setup, which does not include leads for monitoring of the intercostals. Following implantation of HNS in our patient, we added intercostal electromyography to the standard PSG during HNS titration study, allowing us to directly monitor activation of the intercostal muscle group responsible for the sensing lead on the HNS. A 2016 study comparing intercostal EMG activity to respiratory inductance plethysmography (RIP) monitoring for differentiating obstructive from central events showed an increase in sensitivity for chest wall EMG in detecting respiratory effort, with 10.4% of events initially detected as central by RIP monitoring being reclassified as obstructive by chest well EMG, and 2.8% noted to be mixed rather than central4
Report of case(s): Our patient is a 46-year-old female with a past medical history May-Thurner syndrome and nutcracker syndrome s/p stenting, Ehlers-Danlos syndrome, mitral valve regurgitation, Barrett's esophagus, chronic migraines, thyroid cancer s/p radical resection and resultant hypothyroidism, Insomnia, gastroparesis s/p total colectomy, melanoma in situ s/p resection, cholecystectomy, and spinal nerve stimulator implantation. She was initially diagnosed with OSA in 2022 with an AHI 21.8 events per hour, nadir SpO2 87%. She

trialed CPAP, but was intolerant to therapy. She underwent HNS implantation on 3/9/23. The device was activated in the clinic and she underwent polysomnography on 7/31/23 for voltage and setting titration. During the study, we monitored electromyography of the intercostals along with a standard PSG montage.
Conclusion: Intercostal electromyography, in addition to standard polysomnographic montage allowed for direct visualization of the intercostal contraction and subsequent activation of the hypoglossal nerve stimulator. This expanded montage provides more information for the titration study, and may allow for more precise HNS device settings given the increased sensitivity in detecting respiratory effort.
Support (if any):

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1208

A CASE OF COMPLEX SLEEP APNEA IMPROVED WITH CARDIAC RESYNCHRONIZATION THERAPY

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Introduction: Congestive heart failure (CHF) is associated with higher risk of both obstructive (OSA) and central sleep apnea (CSA). While PAP therapy remains the gold standard in the treatment of obstructive sleep apnea, management of CSA needs to be tailored to the underlying pathophysiology. Optimal medical therapy for CHF is essential in the management of sleep-disordered breathing (SDB) among patients with CHF and reduced left ventricular ejection fraction (HFrEF). Cardiac resynchronization therapy (CRT) may have an important role.
Report of case(s): We present the case of an 80 year old male, BMI 29 g/m2 who was evaluated at our sleep disorders center for the management of sleep apnea treated with CPAP 6 cm H2O and comorbid with HFrEF (ejection fraction 35% at the time of presentation) Therapy data from his CPAP device showed elevated residual AHI due to a combination of obstructive and central apneas as well as hypopneas. Significant leak and Cheyne-Stokes respiration were not detected. An empiric pressure increase was made as he was reluctant to return for PAP re-titration. He was also being treated with medical therapy for CHF and underwent CRT several months after presentation to the sleep clinic. Upon follow up he was found to have a dramatic improvement in residual events (AHI 31.2/hr- 6.7/hr) without further changes to CPAP. HFrEF increases risk of CSA through a vicious cycle stemming from significantly lower arousal threshold, high loop gain resulting in an exaggerated ventilatory response to arousals, and prolonged circulatory time leading to mismatched communication of arterial gas concentrations with the chemoreceptors. CHF may independently increase risk of OSA due to vascular engorgement of neck vessels that might affect upper airway patency especially among patients with hypervolemia. The terminal manifestation of a central apnea might be an occlusion of the pharyngeal airway requiring positive pressure to overcome the obstruction. This would explain why CPAP therapy might be effective among patients with HFrEF.
Conclusion: We conclude that the improvement in SDB in our patient is attributable to optimal medical therapy leading to euvolemia, CRT and medical therapy potentially improving cardiac systolic function and PAP therapy maintaining upper airway patency.
Support (if any):

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1209

A CASE OF MORQUIO SYNDROME PRESENTING AS RESPIRATORY FAILURE DUE TO SEVERE OSA AND SUCCESSFUL LONG-TERM TREATMENT

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Introduction: Morquio Syndrome is a lysosomal storage disease (mucopolysaccharidosis type 4) characterized by the accumulation of glycosaminoglycans (GAG) and causes craniofacial, skeletal, and soft-tissue abnormalities. The pathophysiology of obstructive sleep apnea (OSA) is multifactorial due to GAG accumulation in upper airways, adenoids, trachea, and bronchi causing narrowing and collapsibility of the airways.
Report of case(s): A nine-year-old male with Morquio Syndrome presented to the emergency department with difficulty staying awake for 5 days and an upper respiratory tract infection. He would doze off and wake up every few minutes several times a day. He had no prior history of somnolence. He was admitted to the ICU given the severity of the presentation and was clinically started on BiPAP. There was also a history of loud snoring but no witnessed apneas. An in-laboratory polysomnogram was performed to confirm his diagnosis of severe OSA and sleep-related hypoxemia, with an apnea-hypopnea index of 34.1, minimum oxygen saturation 78%, and time < 90% of 74.8 minutes. After a titration study, he was started on noninvasive ventilation (NIV) with bilevel PAP. He remained compliant with outpatient NIV therapy and did not have any hospital admission for respiratory illness. Seven years later, he had a repeat titration study and was switched to NIV with AVAPS. He had one emergency visit for dyspnea and tested positive for influenza. A CT at that time showed severe tracheal stenosis of 8 mm at the thoracic inlet. On direct visualization with laryngoscopy, the stenosis was noted to be around 3 mm, probably due to dynamic airway obstruction. He improved with symptomatic treatment and was discharged the next day. Despite having significant airway abnormalities, he has never required intubation for respiratory failure, likely attributable to consistent use of NIV therapy.
Conclusion: Symptoms of OSA can be subtle, and if unrecognized, can potentially progress to respiratory failure. It is crucial, particularly in children with airway abnormalities, to actively screen for symptoms of OSA and initiate appropriate treatment. Our case highlights successful long-term treatment spanning more than a decade in an individual with Morquio Syndrome and avoidance of tracheostomy using NIV with bilevel PAP and AVAPS therapy.
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1210

INITIATION OF METHADONE FOR REFRACTORY RESTLESS LEG SYNDROME WITH SIGNIFICANT IMPROVEMENT OF SYMPTOMS

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Introduction: Restless legs syndrome (RLS) is a common sleep-related movement disorder. We are reporting a case of progressive and refractory RLS in which a patient had a long history of poorly controlled and worsening RLS with intolerance to first line medications and incomplete management of symptoms.
Report of case(s): Patient is a 62-year-old Caucasian female with a past medical history of RLS, mild obstructive sleep apnea (diagnosed 2021), insomnia (managed with zolpidem), atrial fibrillation, coronary artery disease, obesity, diabetes, hypertension and osteoarthritis. Initial presentation to our clinic was 2 years ago. She reported RLS symptoms 20 years prior with treatment initiated 15 years ago. Symptoms started to worsen 5-6 years ago. She reported sensations in the upper extremities and symptoms starting earlier in the day. She noted intolerance, side effects to and ineffectiveness of first-line medications. Pregabalin produced oral blisters and gabapentin sedated her with minimal benefit to leg sensations. She was on ropinirole 0.25mg in the AM and 2mg in the evening. Dosage was increased but patient found that increased dosage during the day caused sedation and did not alleviate symptoms. Ferritin was low and patient had been on oral iron without change in symptoms. Iron infusion was recommended but deemed not feasible. After the first visit, patient presented 3 months later. She had required an emergency cholecystectomy and was given hydromorphone and morphine while hospitalized. These medications completely alleviated symptoms for several days. Patient had taken other opioid medications including tramadol, hydrocodone and oxycodone in the past without any effect on symptoms. Patient was continued on ropinirole 2mg at night and started on methadone 5mg daily. She has noted a significant improvement in symptoms with almost complete alleviation. She denies any side effects from this regimen and has been stable on this regimen for almost 2 years without worsening symptoms.
Conclusion: This case focuses on the benefit of specific opioids for management of refractory RLS. Initial selection of an opioid may not produce benefit but evaluating response to different medications and tailoring a treatment plan for each individual patient could produce notable alleviation of debilitating symptoms that occur with progressive and refractory RLS.
Support (if any):

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1211

PRESSURE INJURY OF THE FACE AFTER AN OVERNIGHT TITRATION STUDY

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Introduction: We present a case of facial pressure injury related to a CPAP mask occurring within 24 hours of an overnight titration study, an uncommon finding.
Report of case(s): Patient is a 69-year-old man with prior history of OSA who presented to the Henry Ford Sleep Medicine Clinic for reevaluation. His past medical history included class III obesity, diabetes mellitus, hypertension, coronary artery calcification, dyslipidemia and 88 pack-year history of smoking, he quit in 2010. When he was first diagnosed with OSA, he was treated with PAP therapy for 4 years without any reported skin adverse effects. He stopped using PAP therapy for 5 years prior to presentation to our clinic. A home sleep apnea test showed severe OSA with sleep related hypoxia. He underwent a titration study with the use of F&P Evora full face. CPAP was transitioned to BiPAP during the titration due to persistent hypoxia. He felt as though the plastic edge of the mask had cut into his skin during the study. Within 24 hours he noticed facial puffiness, tenderness, redness and facial wounds with increasing purulent discharge. He was seen in the sleep clinic the following day and was prescribed sulfamethoxazole-trimethoprim for a 7-day course for unstageable pressure injury to the face, which soon resolved. Patient was seen by allergy and an allergic reaction to the mask was ruled out. Further work up of hypoxia showed restrictive lung disease on pulmonary function testing and sniff test showed right diaphragmatic weakness.
Conclusion: Pressure injury to the face within 24 hours of using a mask is an uncommon complication of overnight titration studies. To our knowledge, this is the first reported case after using the F&P Evora full face mask which could have been the triggering factor for this type of injury. We suggest proper mask fitting during titration to minimize facial pressure injuries in the sleep lab.
Support (if any):

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1212

HIGHER IS NOT ALWAYS BETTER

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Introduction: Positive airway pressure (PAP) is the recommended first line treatment for obstructive sleep apnea (OSA). Overnight titration studies can be performed to find the optimal PAP settings for patients. However, manual titration studies can lead to higher PAP settings.
Report of case(s): Cases: A 69-year-old man with a body mass index (BMI) of 33 and severe OSA on continuous PAP (CPAP) 10 cm of H2O was referred to sleep clinic for worsening daytime fatigue. He had an in-lab titration study with a full-face mask and was successfully titrated to bilevel PAP (BPAP) with a final inspiratory PAP (IPAP) of 20 cm of H2O and expiratory PAP (EPAP) of 16 cm H2O. Notably during his sleep study, CPAP improved the AHI up to 14 cm H2O, but further increase in CPAP and switching to BPAP worsened the AHI until a final setting of BPAP 20/16 cm H2O was reached. A 75-year-old man with a BMI of 20 and moderate OSA was referred to sleep clinic for persistent daytime sleepiness despite compliant auto-CPAP use with nasal pillows. He underwent an in-lab titration study with a full-face mask and was titrated to BPAP settings of 22/17 cm of H2O. Review of his sleep study showed effective therapy at CPAP of 6 cm of H2O, but further titration on CPAP and BPAP worsened the AHI until a final setting of BPAP 22/17 cm of H2O was reached. Discussion: PAP settings are an important determinant for PAP compliance as patients often do not tolerate higher settings. Manual titration studies have shown to overestimate CPAP requirements compared to the use of auto-titrating PAP in uncomplicated OSA. Furthermore, full-face masks can paradoxically worsen upper airway obstruction and increase treatment pressures compared to nasal masks. It is thought that full-face masks can cause worsening of upper airway obstruction and lead to higher pressure requirements to pneumatically stent the airways.

Conclusion: In conclusion, manual PAP titration studies may exaggerate PAP requirements, especially with the use of full-face masks. Careful review of the titration and choice of mask should be an important consideration in treating OSA.
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1213
VAGAL-NERVE STIMULATION INDUCED REFRACTORY CENTRAL SLEEP APNEA

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Introduction: Vagus nerve stimulation (VNS) is an effective therapy for epilepsy that has previously been suggested to worsen obstructive and central sleep apnea. Management of medically complex patients in the traditional sleep laboratory can present logistical barriers given the minimal medical oversight. Innovative forms of sleep monitoring offer new options to evaluate sleep serially.
Report of case(s): A 69-year-old female with a history of medically refractory generalized epilepsy, on a vagal nerve stimulator, presented to sleep clinic in September of 2022 after undergoing a polysomnogram significant for severe sleep apnea with AHI 3% of 56, AHI 4% of 48, and oxygen nadir of 83%. A November 2022 titration was unsuccessful (residual AHI of 48 and oxygen desaturation nadir of 88%). Periodic breathing proved refractory to CPAP, BiPAP, BiPAP S/T, adaptive servo-ventilation, and attempts to mitigate high loop gain physiology with CO2 modulation techniques, acetazolamide, and supplemental oxygen. VNS setting could not be manipulated in the sleep laboratory safely. She was placed on CPAP setting of 5-10 cm H2O with compliance data showing average residual AHI of 24.3 and 29% of nights being in Hunter-Cheyne-Stokes breathing (HCSB). A planned hospital admission in July 2023 was arranged to monitor sleep with the SleepImage Ring system, which offered measurement of AHI and periodicity without the need for manual scoring. The VNS battery proved depleted during the stay but 5 nights on the same CPAP settings with the VNS off showed a residual AHI 4% of 1-3 with minimal periodic breathing. Patient underwent replacement of VNS generator with reduction of output current to 1/3 of prior value with gradual up-titration. Subsequent CPAP compliance data showed gradual increase in AHI and periodic breathing with rising VNS setting. Currently, the patient is undergoing VNS adjustments to optimize seizure control with plans to restudy sleep breathing at lower nocturnal settings when stabilized.
Conclusion: Sleep apnea induced by VNS can be refractory to therapy. Tracking sleep with the SleepImage system and PAP compliance data allowed understanding of the role of neurostimulation in inducing sleep dysfunction.
Support (if any): Institute for Personalized Sleep Health, Beth Israel Deaconess Medical Center

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1214
A CASE OF MIXED OBSTRUCTIVE AND CENTRAL SLEEP APNEA IN JACOBSEN SYNDROME

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Introduction: Jacobsen syndrome is a rare genetic disorder due to variable deletion lengths on chromosome 11q. The estimated prevalence is only 1/100,000 births in the U.S. Clinical features are multi-system with characteristic facial features, growth and motor retardation, neurocognitive disability, cytopenias, and possible malformations in the CNS, heart, kidneys, and skeleton. Little information is available regarding their sleep and respiratory features.
Report of case(s): A 3 month old girl with a history of Jacobsen syndrome presented to an outside sleep lab due to oxygen desaturations on overnight pulse oximetry. She was diagnosed prenatally due to intrauterine growth retardation. Whole genome sequencing revealed a 15.6 megabase deletion of 11q23.3q25. On polysomnography, she was found to have severe mixed obstructive and central sleep apnea (obstructive AHI 13.4 events/hour, central AHI 8.6 events/hour). She was treated with up to ½ Lpm of O2 via nasal cannula during sleep. CT imaging of the head and MRI of the brain and spine were obtained. These demonstrated absent olfactory nerves, pituitary interruption syndrome, periventricular white matter hypomyelination, lacunar skull, brachycephaly, mild congenital cervical spinal stenosis, and a "split atlas" with incomplete anterior and posterior arches of the C1 vertebra. There was no Chiari malformation and no radiographic abnormalities of the spinal cord. At 6 months of age she was started and maintained on levothyroxine and hydrocortisone for central hypothyroidism and adrenal insufficiency. Repeat polysomnogram at 15 months of age showed an obstructive AHI of 3.2 events/hour, and a central AHI of 5.6 events/hour. While most central apneas were brief (mean duration of 10.4 seconds), there were prolonged central apneas lasting as long as 20.9 seconds. Due to oxygen desaturations to the 70's and 80's following central apneas, oxygen supplementation in sleep was continued.
Conclusion: Multiple features of Jacobsen syndrome (e.g. hypotonia, craniofacial and skeletal abnormalities) increase risk for obstructive and central sleep apnea. We present a girl with Jacobsen syndrome demonstrating both obstructive and central sleep apnea from infancy into toddlerhood. This report highlights the importance of screening for sleep disordered breathing in patients with Jacobsen syndrome, and the need for further research on sleep disturbances in this population.
Support (if any):

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1215
ADJUNCTIVE USE OF SOLRIAMFETOL IN PEDIATRIC EXCESSIVE DAYTIME SLEEPINESS: A SINGLE CENTER EXPERIENCE

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Introduction: Solriamfetol (Sunosi) has been FDA-approved for adults aged 18 years or older particularly for excessive daytime sleepiness (EDS) associated with obstructive sleep apnea or narcolepsy. It works as a selective norepinephrine and dopamine reuptake inhibitor to promote wakefulness in this particular population. The benefit of this medication, compared to other medications to promote wakefulness, is that it is a non-stimulant medication. It has also been noted to have significant long-term

efficacy rates for adults with EDS. Given the success of solriamfetol in the adult population, it has been trialed on EDS patients within the pediatric population. The purpose of this study is to better summarize the safety, efficacy, dosing, and side effect profile of pediatric patients using solriamfetol.
Report of case(s): We performed a retrospective analysis of 11 pediatric patients who have been placed on solriamfetol and studied the improvement of daytime sleepiness with this intervention. Typical up-titration of the medication and monitoring for failure of improvement of sleepiness required a follow up period of at least 3 months. We collected the following data points: gender, weight, age, diagnosis (OSA or narcolepsy), medications, sleep study findings, and subjective endorsement of improvement based on Likert scale with increments of 0-25%, 26-50%, 51-75%, and 76-100% improvement. Our results demonstrated >50% responsiveness in 18% (2/11) of the patients in our cohort with 27% (3/11) of patients having some improvement of their excessive daytime sleepiness by 26-50%. Only 18% (2/11) patients reported adverse effects of headaches or increased anxiety with none of the patients reporting SJS-like rashes or insomnia. All patients tolerated the 150 mg daily dosing. No interactions were noted with patients taking OCPs.
Conclusion: Solriamfetol demonstrates similar tolerability, safety and side effect profile within the pediatric population when compared to the adult population and may provide additional benefit in refractory cases of EDS at maximal doses. More studies are needed to validate these observations.
Support (if any):

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1216
RESOLUTION OF HEADACHES RELATED TO IDIOPATHIC INTRACRANIAL HYPERTENSION AFTER TREATMENT WITH LEMBOREXANT

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Introduction: The orexin (hypocretin) system has attracted interest for its role in the regulation of multiple behavioral processes including feeding, sleep-wake cycle and reward-related behaviors. Dual orexin receptor antagonists (DORAs) target both orexin receptors 1 and 2 and these drugs currently have FDA-approval for insomnia treatment. The orexin system has also been implicated in pain processing through modulation of nociceptive pathways at the periaqueductal gray. Idiopathic intracranial hypertension (IIH) is characterized by evidence of raised intracranial pressure with or without papilledema without an underlying cause. Symptoms include chronic headaches, visual disturbance, and pulsatile tinnitus as well as back and neck pain. Management of IIH can be challenging and includes weight loss, carbonic anhydrase inhibitors and CSF shunting procedures all of which can have variable success in reducing headache frequency. Here we present a case of Lemborexant treatment for chronic insomnia with subsequent resolution of headaches related to IIH.
Report of case(s): A 68-year-old male with a 25-year history of headaches secondary to IIH presented to the sleep medicine clinic for chronic insomnia. He had persistent headaches despite treatment with acetazolamide, zonisamide, nortriptyline and therapeutic lumbar punctures. He reported a history of insomnia for over 20 years. Polysomnography showed no evidence of OSA and actigraphy was consistent with his self-reported insomnia. He was started on mirtazapine for insomnia which was discontinued due to intolerance, and he was started on Lemborexant. When he was seen at follow up one month later, he reported improved sleep, achieving 7-8 hours of restful sleep per night. He also noted complete resolution of his daily headaches and had since stopped all medications required for his IIP treatment. This improvement in his IIH symptoms persisted during his two-month follow-up visit.
Conclusion: This is the first case report to our knowledge showing an improvement in headaches related to IIH in a patient prescribed lemborexant. The relationship between chronic pain and sleep disturbance is complex and there may be a subset of patients with chronic pain including headaches and insomnia who experience improvements in their pain through treatment of their sleep disturbance with DORAs.
Support (if any):

Abstract citation ID: zsae067.01217

1217
A COMPLEX CASE OF PROGRESSIVE HYPERCARBIC RESPIRATORY FAILURE

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Introduction: Progressive hypercarbic respiratory failure in the absence of overt intrinsic lung disease, thoracic cage abnormalities, CNS depressants, or neuromuscular disease poses a unique diagnostic challenge. Furthermore, continued respiratory failure in patients compliant with non-invasive ventilation warrants additional evaluation for alternative diagnoses. We present a case which produced a unique diagnostic challenge to the inpatient sleep medicine service.
Report of case(s): A 46 year-old female with a past medical history significant for T2DM, COVID pneumonia, and seizures presented for acute on chronic hypercarbic respiratory failure in the setting of left hemi-diaphragm paralysis. She experienced multiple (greater than ten) hospitalizations requiring intubation for hypercarbic respiratory failure. Initial work up revealed negative inspiratory force of -40 cm H20. Pulmonary function tests revealed a restrictive pattern with FEV1/FVC of 70%. CT Chest revealed no parenchymal abnormalities. Admission ABG of 7.30/56. She was started on non-invasive ventilation through average volume assured pressure support mode with goal volumes of eight cc/kg. Despite effective ventilatory support with excellent compliance she had increasing requirements leading to near twenty-four hours of total use. Repeat hospitalization occurred for respiratory failure and new left arm weakness which raised concern for underlying neuromuscular disease as etiology. MuSK antibodies were sent and resulted positive at a titer of 1.35nmol/L, consistent with a diagnosis of Myasthenia gravis. The patient was treated with prednisone, plasma exchange, and rituximab with marked improvement in clinical and respiratory status. The patient was successfully weaned down to nocturnal use of non-invasive ventilation with preserved eucarbia.
Conclusion: Myasthenia gravis can lead to marked respiratory muscle weakness and respiratory failure. Common triggers of crisis include infection, medications, electrolyte abnormalities, and thyroid disease. Up to twenty percent of patients present with myasthenic crisis as their initial symptoms. Continued evaluation of forced vital capacity, and

negative inspiratory force are important measures to follow for signs of disease progression. This case proved difficult in the setting of recurrent admissions believed to be secondary to hemidiaphragm paralysis and previous COVID infection. It is imperative to maintain a broad differential in working up respiratory failure and consider myasthenia in the proper clinical context.
Support (if any):

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1218
TO ORDER, OR NOT TO ORDER PRE-OPERATIVE ADENOTONSILLECTOMY POLYSOMNOGRAPHY, THAT IS THE QUESTION

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Introduction: Adenotonsillectomy (AT) is one of the most-commonly performed surgery with over 500,000 cases in children under 15 years of age annually. Two of the most common indications include sleep disordered breathing (SDB) and recurrent tonsillitis. Prior to surgery, preoperative polysomnography is commonly ordered to identify high risk patients for postoperative complications. We report a case of postoperative complication following an elective adenotonsillectomy in a patient suspected of sleep disordered breathing.
Report of case(s): elective Adenotonsillectomy. He was evaluated by otolaryngology for a 1-year history of snoring, witnessed apneas, night terrors in the setting of 3+ tonsillar hypertrophy. No recurrent infections or prior sleep study. Intraoperative findings of adenotonsillar hypertrophy which resulted in adenotonsillectomy without any complications. Post-op complication included hypoxemia (oxygen saturations in the mid 80s while asleep). He was admitted for overnight observation and placed on a facemask with 5 L/min oxygen to keep his saturations >90%. Due to persistent desaturations with sleep, patient was transferred to ICU for a trial of PAP therapy with sleep. Postoperative CXR with ultrasound of the diaphragm demonstrated right hemidiaphragm paresis. Echocardiogram was unremarkable. Patient was discharged home with BPAP, steroids, oral antihistamine/steroid nasal spray with plans on outpatient polysomnogram.
Conclusion: Though, adenotonsillar hypertrophy is the most common cause of SDB; tonsillar size does not always correlate with the severity of SDB. A polysomnography is the gold standard to diagnose and assess the severity of SDB. The 2011 American Academic of Otolaryngology-Head and Neck Surgery guidelines recommend pre-AT PSG in children with SDB and high-risk comorbidities, including obesity, Down syndrome, craniofacial abnormalities, neuromuscular disorders, sickle cell disease, or mucopolysaccharidosis. Pre-AT PSG guides medical decision-making, assess surgical candidacy, and optimize peri-operative monitoring in pediatric patients. Currently, there are no standardized guidelines for perioperative screening for SDB in children. Several barriers contribute to obtaining pre-AT PSG which includes access to pediatric sleep labs, long wait times, and high cost for PSG. Nevertheless, pre-AT PSG in pediatric patients to identify high-risk patients needs to be standardized to provide safer and efficacious pediatric care.
Support (if any): None

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1219
DIAGNOSING NARCOLEPSY BY MSLT WITHOUT TAKING IN THE FULL PICTURE

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Introduction: Narcolepsy is typically diagnosed by symptoms and an abnormal multiple sleep latency test (MSLT). However, many factors can affect the results of the MSLT, leading to an overdiagnosis of narcolepsy.
Report of case(s): A 37-year-old female was referred with prior diagnoses of narcolepsy, depression, post-traumatic stress disorder, polysubstance abuse, obstructive sleep apnea (OSA), and hypertension. The patient obtained the diagnosis of narcolepsy by polysomnography/MSLT through another facility and was prescribed amphetamine/dextroamphetamine. The overnight polysomnogram demonstrated: total sleep time 285 minutes, rapid-eye movement (REM) latency 223 minutes, overall apnea-hypopnea index (AHI) 6/h, and REM AHI 45/h. The next day MSLT demonstrated a mean sleep latency of 7 minutes and 2 sleep-onset REM periods on the second and fourth naps. A urine drug screen (UDS) was not obtained. She reported 4-6 hours of sleep/day at the time of her MSLT. She denied cataplexy, sleep paralysis, or sleep-related hallucinations.
Conclusion: This case is one of many seen at our tertiary referral center of patients presenting with a diagnosis of narcolepsy by MSLT, but the MSLT was performed in invalid conditions. Many medications, substances, insufficient sleep, inappropriate timing of testing, untreated OSA, and other medical conditions all have the potential to lead to an abnormal MSLT that would appear consistent with narcolepsy, but often these factors are not considered. Insufficient sleep at home or on the preceding polysomnogram can lead to an abnormal MSLT. Though our patient had a history of polysubstance abuse, a UDS was not obtained. The American Academy of Sleep Medicine enjoins a polysomnogram for a duration of a 7-hour minimum (with 6 hours of sleep) prior to conducting an MSLT. Our patient only slept for 4.75 hours in the overnight polysomnogram. Her polysomnogram also showed OSA. A combination of these factors likely contributed to the patient's daytime sleepiness. Her insufficient sleep, OSA, and use of sedating medications/substances should have been addressed first before performing an MSLT. We strongly encourage providers to ensure the MSLT is done in valid conditions to prevent the misdiagnosis of narcolepsy and initiation of unnecessary treatment.
Support (if any):

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1220
POLYSOMNOGRAPHY IN CHILDREN WITH JOUBERT SYNDROME

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Introduction: Joubert syndrome is autosomal recessive, clinically and genetically heterogeneous with multiorgan involvement. Classic breathing symptoms include episodes of hyperpnea followed by apnea and periodic breathing. Gas

exchange abnormalities include hyperventilation with low CO2s and intermittent desaturations. Purpose of this abstract is to report prolonged survival, describe the PSG findings and treatment modalities in 2 cases.
Report of case(s): 8-year-old female with Joubert syndrome, global developmental delay, hydrocephalus, hypotonia, cortical blindness presented for initial evaluation of sleep apnea. PSG revealed primarily central sleep apnea with upper airway resistance with snoring with arousal and few episodes of obstructive and mixed apnea and hypopnea. Gas exchange demonstrated episodic, brief desaturations, associated with central apneas. Repeat PSG at 13 years showed intermittent hyperpnea followed by apnea, low ETCO2s with self-limiting desaturations and periodic breathing. Gas exchange revealed low ETCO2 and desaturations. She was treated with clinical observation. PSG at age 20 year demonstrated intermittent hyperpnea followed by episodes of prolonged central apneas, with low ETCO2s and desaturations, and few obstructive hypopneas. Most central apneas associated with self-limiting desaturations, with significant number associated with oxygen saturation below 90%. Gas exchange demonstrated low ETCO2s and episodic desaturations. Supplemental oxygen was prescribed. 20-month-old female with diagnosed Joubert syndrome, cleft lip, polydactyly, hypotonia, dysphagia, and developmental delay presented for loud snoring and gasping during sleep and apneas while awake. Sibling with Joubert Syndrome and a tracheostomy had died. Presented for a second opinion for tracheostomy due to PSG at OSH demonstrating OSAHS with AHI of 18.2, OAI of 3.9 and CAI of 14.3, minimal hypoxemia, normal ETCO2 and SaO2 nadir was 75%. Repeat sleep study done at our center; AHI of 27.7 and OAI of 0.83. ETCO2 was normal, SpO2 nadir was 75% and minimal hypoxemia. Overall PSG demonstrated primarily central apneas with a few obstructive apneas and hypopneas and minimal O2 desaturations. Subsequently underwent BLPAP titration study and treated with non-invasive modality.
Conclusion: PSG in Joubert syndrome demonstrated intermittent hyperpnea and prolonged central apneas with low ETCO2's and brief desaturations. All events were predominantly present in REM sleep. Patients did well with low respiratory support and did not require tracheostomy.
Support (if any):

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1221

MULTIPLE SLEEP LATENCY TESTING IN PATIENTS WITH COMORBID PSYCHIATRIC CONDITIONS: A CASE REPORT

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Introduction: Excessive daytime sleepiness (EDS) has an estimated prevalence of 10-25%. Disorders of central hypersomnolence such as narcolepsy and idiopathic hypersomnia pose a diagnostic challenge since commonly used psychotropic medications can alter REM sleep parameters on polysomnography (PSG). The American Academy of Sleep Medicine has published protocols for the multiple sleep latency test (MSLT), including a 2-week medication discontinuation period (MDP) prior to testing, however discontinuation must be carefully considered.
Report of case(s): A 22-year-old female with obsessive compulsive disorder, attention deficit hyperactivity disorder, and optic nerve hypoplasia presented with episodic EDS for several years. Epworth was 14 despite amphetamine-dextromphetamine 30mg twice daily. These episodes would last for 1-2 weeks without associated hypersexuality, increased food seeking behaviors or changes in cognition. Additionally, she would experience periods of not sleeping for days at a time, but not decreased need for sleep. She denied cataplexy, sleep-related hallucinations, or sleep paralysis. No symptoms of bipolar disorder reported. Initial polysomnography showed 432 minutes of sleep, REM latency of 39.5 minutes and AHI of 0.1. MSLT showed a mean sleep latency of 11.5 minutes without sleep onset REM periods. She reported later that she was unable to complete the MDP for escitalopram. The diagnosis at that time was hypersomnolence related to a mental disorder, and referred back to psychiatry. She returned 20 months later with more persistent hypersomnolence and a MDP was attempted again, this time with confirmation. She stopped venlafaxine and stimulant per protocol. PSG was again unremarkable and MSLT showed mean sleep latency of 7 minutes across 5 naps and SOREMP in 4 naps, resulting in the diagnosis of type 2 narcolepsy.
Conclusion: Sleep symptoms are common in patients with comorbid psychiatric conditions, and MDP can pose safety risks or be poorly adhered to. Longitudinal follow-up, repeat testing for persistent and worsening symptoms of EDS, and careful questioning about adherence to MSLT protocol can help clarify the eventual diagnosis.
Support (if any): None.

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1222

THESE BOOTS WERE MADE FOR WALKING, BUT NOT SLEEPING

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Introduction: Somnambulism occurs during slow wave sleep, prompted by an arousal, followed by sitting up or walking, disorientation with no recollection of the event, and falling back asleep. While somnambulism/sleepwalking is a parasomnia that is not typically associated with Ehlers-Danlos syndrome (EDS), it was the presenting sleep disorder in a patient, with multiple etiologies of insomnia.
Report of case(s): A 54-year-old female with a history of chronic insomnia, attention-deficit/hyperactivity disorder (ADHD), EDS, and osteoporosis presents with somnambulism. Patient reports sleepwalking since childhood and continuing to sleepwalk into adulthood. Fifteen years prior, she became a paramedic, worked 24-hour shifts, and developed insomnia. Patient started her first insomnia treatment with zolpidem 5 years ago, which increased her sleepwalking frequency from twice a week to daily and included more complex behaviors like preparing food. Patient retired with disability 4 years prior due to recurrent fractures and joint deformities secondary to her osteoporosis and EDS. She took cyclobenzaprine, methocarbamol, oxycodone-acetaminophen, and pregabalin for chronic pain, and dextroamphetamine-amphetamine for ADHD. Patient presented to Sleep Medicine

clinic July 2023 where zolpidem was changed to clonazepam. At her follow up December 2023 visit, exam was notable for her wearing a left post operative short boot. Her sleepwalking had ceased, but insomnia worsened. It was taking her 3 hours to fall asleep after her 6PM bedtime, and 1 hour to fall asleep after nocturia-related awakenings 1-2 times per night. Since her surgery three weeks prior, she had been dozing off during the day, likely from her sedative pain medications. We recommended delaying her evening pain medications and bedtime and ordered a sleep study.

Conclusion: Chronic pain, fatigue, and pain medications used to treat EDS contribute to this population's higher rates of sleep disorders like insomnia. They also have higher rates of obstructive sleep apnea due to nasal-maxillary cartilage changes, that are successfully treated with nasal CPAP. Psychiatric disorders, including anxiety, mood disorders, and ADHD are also more common in this population, and carry their own sleep pathology. While the patient's primary sleep complaint was somnambulism, it was important to evaluate for and treat underlying sleep disorders for optimal outcomes.

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1223

REM-RELATED LEG CRAMPS

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Introduction: Nocturnal leg cramps are common in the general population and is reported in 30% of adults. It is described under sleep related movement disorders in the International Classification of Sleep Disorders. It is a painful sensation in the legs that occurs during sleep or out of sleep but is not necessarily associated with a particular stage of sleep, relieved by stretching. We present a case of nocturnal leg cramps occurring during REM sleep.

Report of case(s): Patient is a 53-year-old female reporting a history of waking from sleep with leg cramps. She underwent a CPAP titration study at our facility for a previously documented obstructive sleep apnea (AHI of 28, REM AHI of 74.1). On video, she was seen to wake abruptly out of each of the three REM sleep episodes, sitting and rubbing her calves, and reporting to the technician that she was having leg cramps. She would then get up and walk around to relieve the cramps but was able to return to sleep. Each episode lasted 3-5 minutes and was only relieved with movements or massage. No leg cramps were reported from non-REM sleep during this study. She denied symptoms of restless legs syndrome. Her periodic limb movements of sleep indices during her diagnostic and CPAP polysomnograms were 2.0 and 5.1 respectively and occurred during non-REM sleep. Medical history includes asthma and COPD (oxygen supplementation as needed), heart disease, prior polysubstance use disorder, and treated infective endocarditis in 2011.

Conclusion: Our case characterizes nocturnal leg cramps that occurred at a particular sleep stage, in this case strictly during REM sleep. Nocturnal leg cramps have been reported in the literature in association with various medical comorbidities including vascular disease and OSA. Further, it has been reported that CPAP therapy for OSA results in near or total elimination of leg cramp burden. It is unclear what is the mechanism of REM-related leg cramps, but it could be the REM OSA. To our knowledge, this is the first documented case of REM-related nocturnal leg cramps. We hope to add to the present literature on the mechanism of this disorder.

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1224

MANAGEMENT OF DOPAMINERGIC AUGMENTATION OF RESTLESS LEGS SYNDROME WITH CONCURRENT HIGH DOSE BENZODIAZEPINE THERAPY

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Introduction: Restless Legs Syndrome (RLS) or Willis-Ekbom disease, is sleep related movement disorder characterized by an irresistible urge to move the legs, often accompanied by uncomfortable and unpleasant sensations. Over the years, dopaminergic agonists (DAs) have served as the primary treatment for RLS. However, the emergence of dose-dependent augmentation has prompted a shift in the management approach. This change is marked by a growing emphasis on prioritizing alpha2-delta calcium channel ligands (A2D) as alternative therapeutic agents

Report of case(s): We report a case of a 70-year-old woman with a 15-year history of RLS, with crawling and unpleasant sensation of her legs preventing from falling asleep, successfully managed initially with pramipexole 0.5mg at night and eventually started on clonazepam. With escalating symptoms, Pramipexole and Clonazepam gradually increased. Despite dose escalation of pramipexole to 0.75mg and clonazepam to 4mg nightly, symptoms persisted and even intensified. Abruptly discontinuing Pramipexole and transitioning to ropinirole at 1mg and continuing Clonazepam 4mg nightly failed to yield improvement. Patient presented for consultation at this time highlighting the severity of RLS augmentation as moderate. Recommendation in this situation is to introduce A2D or possible opiate medication to ameliorate symptoms before tapering DA. The patient's high-dose benzodiazepine regimen increases respiratory depression and fall risk, hindering the standard approach of introducing alternative agents. In response, a tailored strategy was implemented, gradually tapering clonazepam while initiating gabapentin therapy, RLS symptoms began to improve. Subsequent cautious tapering of ropinirole contributed to sustained relief. This case demonstrates the need for individualized approaches in managing dopaminergic augmentation in RLS, especially when high-dose benzodiazepines are involved.

Conclusion: In navigating the intricacies of RLS treatment, our case highlights the effectiveness of a nuanced approach when confronted with dopaminergic augmentation alongside concurrent high-dose benzodiazepine therapy. Tapering benzodiazepines and introducing gabapentin proved successful, emphasizing the importance of tailored interventions. This case contributes to the understanding of RLS management in complex scenarios.

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1225

VAGAL NERVE STIMULATOR-INDUCED SLEEP DISORDERED BREATHING

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Introduction: Vagus nerve stimulator (VNS) is used for the treatment of refractory epilepsy. It can alter breathing patterns leading to sleep-disordered breathing (SDB). Screening for SDB is recommended before and after initiation of VNS therapy. We present a case of VNS-induced SDB which responded to continuous positive airway pressure (CPAP) therapy.
Report of case(s): A 40-year-old Caucasian female underwent a home sleep apnea test (HSAT) due to symptoms of snoring, difficulty initiating sleep, teeth grinding, vivid dreams, nightmares, excessive daytime fatigue, and sleepiness. She denied parasomnia, symptoms of narcolepsy, and restless leg syndrome. Her habitual sleep duration was 9 hours with a sleep latency of 1 hour. She had 2-3 nighttime awakenings without nocturia. Pertinent medical history included refractory focal epilepsy, traumatic brain injury, insomnia, and attention deficit disorder. Medications were eslicarbazepine 800 mg daily, topiramate 200 mg twice daily, lamotrigine 100 mg daily, trazodone 300 mg nightly, and Adderall 60 mg daily. She had a VNS implanted 5 years ago. VNS settings were frequency of 20 Hz with on and off time of 30 and 60 seconds respectively. Her body mass index was 21 and Epworth Sleepiness Scale score was 15. HSAT showed significant periodic breathing without Cheyne stokes respiration and a 4% apnea-hypopnea index (AHI) of 9.6/hour. Follow-up diagnostic polysomnogram (PSG) revealed periodic breathing with the respiratory events occurring during VNS on time and abnormal sleep architecture including prolonged sleep and rapid eye movement (REM) latency, increased slow wave sleep, and pseudo spindles. The respiratory events were not associated with significant sleep fragmentation or desaturation. The AHI was 6.4/hour. Respiratory events improved with CPAP 7 cmH20 during titration PSG. She will be followed up in the sleep clinic to evaluate the effectiveness of CPAP therapy.
Conclusion: There is a complex relationship between epilepsy and SDB. Antiepileptics and VNS can cause new onset or worsening SDB. Management options for VNS-induced SDB include PAP therapy, changing VNS settings, or alternate therapies for refractory epilepsy. A multimodal approach requiring input from the patient, a sleep specialist, and an epileptologist is recommended for optimal results.
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1226

SHIFT WORKERS ACTING OUT? A CASE OF SHIFT WORK SLEEP DISORDER CAUSING REM BEHAVIOR DISORDER

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Introduction: Rapid eye movement behavior disorder (RBD) is the manifestation of dream enactment with the failure of muscle atonia during rapid eye movement (REM) sleep. Shift work sleep disorder presents as sleep disruption and/or excessive sleepiness due to an atypical work schedule. Here we show a unique case of RBD provoked by a longstanding history of shift work sleep disorder.
Report of case(s): 67-year-old male with shift work sleep disorder, hypertension, and depression who presented for evaluation of RBD. Patient recently retired as a night shift worker and was taking melatonin and citalopram for more than 20 years. For the past several months, the patient has been having episodes of acting out his dreams, such as punching his wife if he was dreaming about punching someone in his sleep. Patient's polysomnography showed REM sleep without atonia (RWA) in the chin and limb leads with 30% of the 30-s epochs having chin EMG activity with bilateral flexor digitorum superficialis (FDA) phasic EMG activity. Patient's melatonin dose was increased and he was also started on benzodiazepine with control of his symptoms.
Conclusion: The common risk factors of RBD include Parkinson's Disease, occupational toxin exposure, antidepressants, psychological stress (PTSD), or compromised health conditions (such as smoking or cardiovascular diseases). The patient has a chronic use of citalopram but antidepressant-induced RBD usually presents in the fourth/fifth decade of life. A review of literature indicates no cases of shift work disorder causing RBD. However, disruptions in the circadian rhythm put shift workers at an increased risk for conditions such as cardiovascular disease, metabolic syndrome, and psychological disorders, all exposures for RBD. Patient developed shift work sleep disorder causing sleep-onset and sleep-maintenance insomnia with a disturbance in the circadian rhythm, ultimately leading to an increased risk for developing RBD. Treatment for RBD includes melatonin as the first-line treatment with addition of low-dose clonazepam or cholinergic agents. With the increasing prevalence of shift work, it is imperative to understand the risks of shift work and identify sleep disorders that may arise, such as RBD, through more research.
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1227

SPINAL STENOSIS AS A RARE CAUSE OF CENTRAL SLEEP APNEA

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Introduction: Central sleep apnea is characterized by lack of drive to breathe during sleep, resulting in periods of insufficient ventilation and compromised gas exchange. CSA causes based on the awake Paco2 either hypercapnic and a nonhypercapnic group. Common causes include high-altitude, congestive heart failure, and chronic use of opioids and its very rare to be secondary to spinal stenosis.
Report of case(s): 49 years old male patient known to have hypertension and cervical spondylosis causing severe canal stenosis on epidural steroid injection. He was Referred to sleep medicine clinic for the assessment of possible obstructive sleep apnea, as he has interrupted sleep, history of snoring and witnessed apnea. Calculated STOP BANG 6. on examination, BMI 33, neck circumference 44 cm, micrognathia and malapati class 4, Split night sleep study showed severe respiratory events with AHI of 125.4 mainly central apneas with total 177 episodes, Frequent arousals related to events and oxygen desaturation were recorded to 82%. End tidal CO2 reached 57 mmhg during the study. CPAP titration was initiated and pressure gradually increased and ended at 12.0 cmH2O where all respiratory events were controlled with REM sleep supine position. Day time arterial blood gas showed PH 7.437 PaCo2 39mmhg, PaO2 86.9 mmhg and Hco3 26.2 mmol/ liter with base excess +2.1. Investigation for the cause of central sleep apnea were negative except for cervical MRI which showed multilevel degenerative disc disease at the level of C3-C4 ,C4-5, C5-6 and C6-7 causing different severity of neural foramen stenosis and nerve root

compression. Based on the investigations the patient was diagnosed with severe central sleep apnea secondary to severe spinal stenosis, he was started on CPAP 12 cmh2o well tolerated and complaint to the PAP and his latest CPAP data showed AHI of 8/hour. For the spinal stenosis he is following with spine surgery and pain management team for pain control.
Conclusion: To diagnose the cause of central sleep apnea it is mandatory to exclude all other possible causes and consider spinal stenosis when facing a case with isolated central sleep apnea.
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1228

THE IMPACT OF MODIFIED UVULOPALATOPHARYNGOPLASTY AS A BRIDGE TO HYPOGLOSSAL NERVE STIMULATION ELIGIBILITY

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Introduction: Severe Obstructive Sleep Apnea (OSA) presents a significant challenge, particularly in cases where patients exhibit intolerance to conventional treatments like Continuous Positive Airway Pressure (CPAP). When the Apnea-Hypopnea Index (AHI) remains markedly high, individuals often seek advanced interventions, such as Hypoglossal Nerve Stimulation (HGNS). However, some individuals face elevated AHI scores that surpass the threshold for qualification for HGNS. This narrative documents a patient's journey through a series of interventions, starting from failed CPAP therapy to undergoing Modified Uvulopalatopharyngoplasty (UPPP), which played a pivotal role in reducing their AHI. Subsequently, the placement of an HGNS implant led to the resolution of their OSA.
Report of case(s): Our patient, a 65-year-old man battling severe OSA, experienced CPAP intolerance with an initial AHI of 88. Despite weight loss, his AHI remained above the acceptable range (15-65) for HGNS. Seeking alternatives, the patient underwent a transformative Modified UPPP, resulting in a significant reduction of his AHI. This improvement enabled his eligibility for HGNS. Post-implantation, marked improvements ensued: cessation of snoring, enhanced sleep quality, and substantial overall well-being. Despite transient swallowing difficulties post-surgery, the patient's overall course was without complications and largely successful. His journey highlights UPPP's pivotal role in lowering AHI to qualify patients for advanced therapies, suggesting a promising strategy for managing severe OSA in individuals with refractory AHI levels.
Conclusion: In conclusion, our patient's journey showcases the transformative impact of Modified UPPP, not only in reducing AHI and enabling eligibility for HGNS but also in revealing a pathway for tailored interventions in severe OSA cases. This emphasizes the importance of personalized treatment strategies, and prompts consideration for the integration of multi-tiered interventions in managing complex cases of OSA.
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1229

DUAL NEUROSTIMULATOR THERAPY FOR CSA AND OSA IN AN ELDERLY GENTLEMAN WITH NATIVE PACEMAKER

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Introduction: We describe a case of severe central sleep apnea with concomitant obstructive apnea treated with a stepwise approach with Transvenous phrenic nerve stimulation and Hypoglossal nerve stimulator.
Report of case(s): 70 yo male with medical history of diabetes, chronic kidney disease stage 3, coronary artery disease with coronary artery bypass in 1997, aflutter with failed ablation (2015, persistent atrial fibrillation, bradycardia with pacemaker implantation (2016), lymphocytic leukemia, treated with methotrexate, underwent a home sleep study in 2018 which showed severe sleep apnea (AHI 55% and O2 nadir 72%). This was followed by a titration study which showed predominant CSA not amenable to CPAP, BPAP or BPAP ST. Echo was performed which showed LVEF 40%. Baseline in lab PSG was performed which showed AHI of 89.5/hour (225 central,36 mixed and 15 obstructive events). REM AHI: 65, REM RDI 65, Supine AHI 90/hour and supine RDI 90.1. Cheyne stokes breathing was observed throughout the study along with significant sleep hypoxia. Medical management failed and patient was not a candidate for ASV given low EF. Remede device was implanted in 2018 for management of CSA. For obstructive apnea, APAP was prescribed however patient tolerance remained poor with suboptimal control of OSA. Repeat PSG showed resolution of CSA and CCB with persistent severe obstructive events AHI 72. With control of CSA, patient underwent DISE which showed Anteroposterior collapse of the vellum qualifying the patient for Inspire.
Conclusion: Traditional treatment for CSA involves optimization of any underlying medical conditions and positive-pressure ventilation with certain limitations. In a subset of patients, CSA remains refractory to medical management and failure rates of PAP therapy remain high. Transvenous PNS significantly improves CSA severity, sleep quality, ventricular function, and QOL regardless of HF status and should be considered in patients with high CSA burden. Once CSA management is optimized, patients with high OSA burden and PAP intolerance can then be considered for HNS. Most of these patients with underlying heart failure may have native ICD or pacemaker, requiring careful assessment of device-device interaction.
Support (if any):

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1230

MANAGEMENT OF SEVERE OSA WITH HGNS: IMPORTANCE OF IN-LAB SLEEP STUDIES FOR ACCURATE ASSESSMENT-BA CASE REPORT

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Introduction: Continuous positive airway pressure (CPAP) therapy is gold standard treatment for obstructive sleep apnea. Compliance issues and CPAP/BPAP intolerance have paved the way for alternative interventions such as the Hypoglossal Nerve Stimulation (HGNS) device. HGNS works by directly stimulating the hypoglossal nerve in synchrony with respirations to open the airway via tongue stiffening and protrusion, ultimately preventing airway collapse during sleep.1
Report of case(s): This case report is about a 70-year-old male who has history of severe OSA with significant hypoxemia, being managed with a HGNS implant due to CPAP intolerance. Sleep

study after HGNS device activation, showed adequate treatment of OSA, AHI improved to normal range, however, persistent hypoxemia (SpO2 less than 88% for 90 min) was noted. An overnight pulse oximetry study again revealed significant hypoxemia with SpO2 less than 88% for 121 minutes. A home sleep study showed ongoing moderate OSA and hypoxemia with an AHI 26.2 per hour based on 3% desaturation hypopneas and AHI 16.0 per hour based on 4% desaturation hypopneas, in association with significant hypoxemia (SpO2 less than 88% for 54 min) despite using the HGNS implant. He was tested with an in-lab sleep study for the purpose of initiation of supplemental oxygen for management of significant hypoxemia. This study showed significant improvement of AHI to normal range of < 5/hour at setting of 2.7 V, and no significant hypoxemia was noted.
Conclusion: The case highlights a potential discrepancy in evaluating sleep apnea severity using home sleep apnea tests in patients with HGNS device. Most insurance companies approve home sleep apnea tests, but it is advised that patients with HGNS devices showing persistent significant OSA or hypoxemia on a home sleep study undergo a repeat in-lab sleep study for a more accurate estimation of sleep apnea severity and hypoxemia.
Support (if any): References 1. Olson MD, Junna MR. Hypoglossal Nerve Stimulation Therapy for the Treatment of Obstructive Sleep Apnea. Neurotherapeutics. 2021 Jan;18(1):91-99. doi: 10.1007/s13311-021-01012-x. Epub 2021 Feb 8. PMID: 33559036; PMCID: PMC8116425. 2. Punjabi NM, Aurora RN, Patil SP. Home sleep testing for obstructive sleep apnea: one night is enough! Chest. 2013 Feb 1;143(2):291-294. doi: 10.1378/chest.12-2699. PMID: 23381307; PMCID: PMC3566993.

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1231

IT IS ALL ABOUT THE MASK

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Introduction: Positive airway pressure (PAP) therapy is the mainstay of treatment for adults with obstructive sleep apnea. One important factor for PAP therapy is choosing the optimal mask type. Multiple studies demonstrate a higher residual apnea-hypopnea index (AHI) and more leaks with the use of oronasal masks compared with nasal masks, yet oronasal masks are routinely chosen as the first-line option.
Report of case(s): An 80-year-old man had a split polysomnogram with a diagnostic apnea-hypopnea index (AHI) 65.8/h, central apnea index (CAI) 0.4/h, and oxygen nadir 76%. During the study, on continuous positive airway pressure (CPAP) 10 cmH2O with an under-the-nose nasal mask, sleep-disordered breathing was resolved with a residual AHI of 0.7/h with supine REM sleep achieved. The patient was set up with CPAP 10 cmH2O; however, after 1 week of CPAP treatment, a notification indicated that his PAP-AHI was elevated in the 40s/h. After exploring several possible causes, we discovered that he was using an oronasal mask at home. A change to a nasal mask or pillows was recommended. While awaiting mask refit, he was also changed to auto-titrating PAP (APAP) settings of 10-20 cmH2O. PAP download data are as follows. On CPAP 10 cmH2O with an oronasal mask: 12/12 days used, 95th percentile leak 0.3 lpm, AHI 31.7/h (CAI 4.3/h). On APAP 10-20 cmH2O with an oronasal mask: 6/6 days used, median pressure 14.9 cmH2O, average maximum pressure 19.6 cmH2O, 95th percentile leak 0.0 lpm, AHI 26.0/h (CAI 3.6/h). On APAP 10-20 cmH2O with a nasal mask + chin strap: 45/45 days used, median pressure 10.4 cmH2O, average maximum pressure 12.5 cmH2O, 95th percentile leak 5.5 lpm, AHI 2.2/h. Average nightly use of PAP was >6 h at all assessments.
Conclusion: Individuals involved in PAP management, including providers, sleep technologists, and durable medical equipment groups, need to be aware that oronasal masks may not provide the same level of benefit as nasal masks or pillows. Additionally, the type of PAP mask used during in-laboratory PAP titration compared to home use is also of importance as therapeutic pressures may be largely different as demonstrated in this case.
Support (if any):

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1232

SHALL WE HOLD OR SHALL WE SLEEP

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Introduction: Nocturia is a common symptom among individuals with untreated and undiagnosed obstructive sleep apnea and is described as waking up from sleep two or more times to void. Interestingly, nocturia is not included in the American Academy of Sleep Medicine clinical practice recommendation to evaluate OSA in adults. Women's OSA symptoms differ from men's, and they are sometimes ignored or attributed to depression or insomnia, leading to an underestimation of OSA diagnosis. Especially nocturia in women is more frequently disregarded as a cause for sleep disturbances. A recent systematic analysis found a lack of data on the prevalence of OSA in Asians, particularly Asian women.
Report of case(s): A 65-year-old Asian female with a history of osteoporosis who presented to the clinic with a chief complaint of nocturia. Historically, patient went to bed at 11 P.M. and awoke at 6 A.M. She denied history of any other sleep disorders. She complained of frequent nocturia which occured 3-4 times per night, requiring her to wake up every 1 or 2 hours to use the bathroom affecting sleep maintenance. She tried oxybutynin and mirabegron without much improvement. She did not report snoring, having witnessed apneas, or daytime fatigue. Her BMI was 21 and her neck circumference was 13 inches. A home sleep study was done resulting AHI 21.6, showing evidence of moderate obstructive sleep apnea. Patient was recommended to start Auto-CPAP. At 6-month follow up, she reported improvement in her nocturia symptom.
Conclusion: OSA has received increased public attention in recent years, and it is recognized to have serious health consequences if left untreated. Current screening standards in primary care include BMI, sex, age, pharyngeal anatomy, snoring, excessive daytime sleepiness, and the presence of hypertension. However, nocturia isn't included despite the fact that it is frequently reported and related with OSA. Nocturia is improved by treating OSA with PAP treatment or a mandibular advancement device. As a result, more research needs to be done on screening for OSA when nocturia is present, particularly in Asian women, in order to increase the efficacy of the screening method.

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DELAYED SLEEP-WAKE PHASE DISORDER: YOUR PCP'S INSOMNIA

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Introduction: Delayed Sleep-Wake Phase Disorder (DSWPD) is commonly mistaken for sleep onset insomnia although it is one of the most frequently seen circadian rhythm sleep-wake disorders. These patients typically deal with comorbid depression that is more severe than the general population. Delayed diagnosis can lead to impaired cognitive function, metabolic changes, and a compromised quality of life. Hence, we report a case of a young adult referred to our clinic for management of DSWPD masked as sleep onset insomnia.

Report of case(s): A 30-year-old female with past medical history of Ulcerative Colitis and Depression initially presented to PCP for "trouble sleeping". Patient states she was given multiple medications including melatonin, Trazodone, and Seroquel. With no improvement of symptoms, the patient was referred to Sleep Medicine. On evaluation, a sleep log revealed the patient was consistently falling asleep around 830am and waking up between 330-630 pm with few mid sleep disturbances. She revealed the sleep problems started after a car wreck ten years prior and worsened significantly in the past two years. Of note, the patient dealt with snoring, daytime tiredness, and apneas for which a home sleep apnea test (HST) was done. HST revealed an AHI of 0.0 and oxygen nadir of 91%. Patient had significant strife with sleeping pattern as she was unable to socialize during the daytime and experienced worsening depression. A comprehensive plan was made to slowly advance the sleep phase with Melatonin 0.5mg-1mg to be started at 2am with plan for further advancement once new steady state was achieved; along with, light therapy upon awakening and cognitive behavioral therapy.

Conclusion: Although there has been improvement in sleep training, there is still a significant need for increased exposure to sleep pathology in residency programs. Our patient experienced a delay in diagnosis for over two years. The patient had worsening depression in this time and was improperly managed. DSWPD is a relatively common sleep disorder and thorough clinical assessment of sleep and wake up times can help elucidate a diagnosis. This case cries to our need to improve sleep education among trainees so that we can better serve our patients.

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1234

MANAGING IDIOPATHIC HYPERSOMNIA IN A PATIENT FOLLOWING SLEEVE GASTRECTOMY

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Introduction: Sleeve gastrectomy (SG) is a weight loss surgery removing approximately 80% of the stomach1 resulting in a narrower, tubular stomach "sleeve". It's considered a restrictive procedure wherein weight loss is achieved by limiting the volume of food intake by diminishing the stomach's capacity. In Roux-en-Y(RYGB), parts of the small intestine is bypassed and the remaining portion is connected to a newly created smaller stomach. By surgically bypassing regions of the small intestine, RYGB limits nutrient absorption leading to weight loss. It's considered both a restrictive and malabsortive procedure; thus RYGB is associated with more pharmacologic/metabolic concerns compared to SG. Although there is minimal literature comparing drug absorption between SG vs RYGB, some data proposes both SG and RYGB lead to nutrional deficiencies suggesting SG may also be a malabsorptive procedure altering drug pharmacokinetics by increasing transit time, altering gastric pH and reducing bioavailability for extended-release formulations.

Report of case(s): A 41-year-old female with past medical history of sleeve gastrectomy is seen for management of idiopathic hypersomnia (IH). IH was confirmed after a polysomnogram ruled out obstructive sleep apnea (OSA). The MSLT revealed a mean sleep latency of 6.8 minutes without SOREMPs, and excluded central causes. She has tried multiple combination of medications: dextroamphetamine and amphetamine immediate (IR) and extended release (XR), modafinil, and armodafinil. Currently, she is taking dextroamphetamine and amphetamine IR 30 mg in the morning and 15 mg in the afternoon and modafinil 200mg in the morning. She reports significant sleepiness 2-3 hours after taking her medications.

Conclusion: While SG primarily impacts the stomach, it's crucial to note that the procedure can influence drug absorption with effects such as increased drug transit time, and changes in pH. In bariatric surgery patients, utilizing dosage forms that allows drug disintegration, resistant to acidic environments, and has increased bioavailability—such as liquids or even transdermal formulations—may mitigate altered drug absorption. For this patient, we have discussed smaller and more frequent doses of dextroamphetamine and amphetamine IR formulations e.g 20 mg IR every 3-4 hours (maximum 60 mg today daily dose). If this is not effective, calcium, magnesium, potassium & sodium oxybate can be considered.

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SLEEP ARCHITECTURE IN SCHOOL-AGE CHILDREN WITH SPASTIC CEREBRAL PALSY

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Introduction: 10 cases of school-age children with a diagnosis of spastic cerebral palsy (CP) are described, which are within the APAC. Comprehensive Care Model. where diagnosis, rehabilitation, formal and alternative education are received in which

polysomnography (PSG) with the international 10-20 system and simultaneous video was indicated, due to neurological risk factors and a recently implemented diagnostic protocol.
Report of case(s): 10 children (age: 8.3±1.8; females: n=7 [70%]. An increased sleep latency was shown (32.8 ± 32), with expected REM sleep latency (103.1 ± 37.7), without alterations regarding the sleep macrostructure, with an increased awakening rate (10.9 ± 4.8). Regarding the respiratory part, with a mean apnea-hypopnea index (AHI) of (5.5 ±4.7), 50% of the participants had more than 4 events per hour with a predominance of hypopneas during REM and supine position. Abnormal activity was recorded in 100%, with predominance in the left hemisphere (60%), with detection of motor manifestations in 80%; Only 70% of these patients have treatment for epilepsy. Finally, sweating artifact was detected in 60% of cases.
Conclusion: These are school-age children diagnosed with CP who have data on sleep fragmentation associated with the presence of abnormal electroencephalographic activity and obstructive sleep apnea-hypopnea syndrome. Multidisciplinary management of the detected nosological entities is recommended, with the aim of reducing sleep fragmentation, regulating EEG activity and respiratory events; Likewise, continue with rehabilitation plans in order to improve spasticity that would help change position and reduce nocturnal diaphoresis.
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1236
A CHALLENGING TRANSITION BETWEEN VOLUME ASSURED MODES IN A PATIENT WITH CONGENITAL LUNG ABNORMALITIES

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Introduction: The advent of volume-assured modes for non-invasive ventilation (NIV) has improved treatment of more complicated sleep-disordered breathing (SDB), although can present challenges in choosing ventilatory modes in patients with abnormal pulmonary anatomy.
Report of case(s): Our Patient is a 44 year-old female with hypoplastic right lung, pulmonary hypertension and chronic hypercapnic/hypoxic respiratory failure on nocturnal NIV for complex sleep disordered breathing. She failed CPAP, BIPAP and BIPAP S/T. Average volume assured pressure support (AVAPS) NIV was initiated with stabilization in awake carbon dioxide levels, improved sleep quality and daytime energy . She was transitioned to an iVAPS (intelligent volume-assured pressure support) ventilator when eligible for new NIV. Initial settings were empiric, targeting Alveolar Ventilation 3.3 l/min to approximate similar minute ventilation set on previous AVAPS (Assumed dead space ventilation 1.05 l/min or 70 cc x 15rr). Despite relatively similar recorded pressures and respiratory parameters between the two volume-targeted ventilators, she experienced air hunger, palpitations and increased morning headaches after change from AVAPS to iVAPS. Alveolar ventilation target was increased to 4.5 l/min, yet symptoms persisted. She subsequently returned to AVAPS, with symptom resolution.
Conclusion: This case highlights the uncertainty in transitioning volume assured ventilator modes that use different algorithms to achieve ventilatory targets. We hypothesized incorrect dead space estimates in the setting of her abnormal pulmonary anatomy may lead to inequivalent respiratory targets between modes, but this does not appear to be the case based on available data. The sensation of dyspnea is complex, thus it is possible subtle changes in rise time, breath delivery, cycling and triggering may have contributed to air hunger. Furthermore, many assumptions are made when transitioning between intelligent ventilator modes and these assumptions are based on “normal” respiratory dynamics.
Support (if any): Note- Chart would not transfer, abbreviated data placed below. Settings- (both modes) EPAP 6, Min ipap 17, max IPAP 30 AVAPS- Tidal volume 300, T insp max 2 second, rise time 200 ms iVAPS- Alveolar ventilation 3.3 l/min, T insp max 2 sec, rise time 200 ms Outcome AVAPS- RR 14-15, TV 301-313, MV 4.3, IPAP 20.6, triggered 36% iVAPS- RR 15-32, TV 300-480, MV 4.5, IPAP 20.6, Triggered 30%

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