UNIVERSITY OF PITTSBURGH

Center for Sleep and Circadian Science

Research Day

November 12, 2024

The 9th Annual Sleep and Circadian Science Research Day

November 12, 2024

Program

8:15 am – 9:00 am	**Registration/Breakfast – Sponsored by Avadel Pharmaceuticals**	
9:00 am – 9:20 am *WPU Assembly Room*	**Program Chair:**	**Jonna Morris, PhD, RN** Assistant Professor of Health and Community Systems University of Pittsburgh School of Nursing
	Opening Remarks:	**Daniel Buysse, MD** Distinguished Professor of Psychiatry, Medicine, and Clinical and Translational Science UPMC Endowed Chair in Sleep Medicine
9:20 am – 10:25 am *WPU Assembly Room*	**Clinical Symposium** **HOT TOPICS IN TREATMENT OF SLEEP APNEA**	
	Chair:	**Mark Thomas, PhD** Advanced Postdoctoral Fellow Mental Illness Research, Education, and Clinical Center (MIRECC) VA Pittsburgh Healthcare System
	Panelists:	**Mark Thomas, PhD** Advanced Postdoctoral Fellow Mental Illness Research, Education, and Clinical Center (MIRECC) VA Pittsburgh Healthcare System ***COMISA: What is it, and how do we treat?***
		Charles Atwood, MD, FCCP, FAASM Associate Professor of Medicine Pulmonary, Allergy and Critical Care Medicine Chief, Sleep Medicine Division, VA Pittsburgh Healthcare System ***Alternative Treatment to CPAP: Medications***
		Thomas Kaffenberger, MD Assistant Professor Department of Otolaryngology-Head and Neck Surgery ***Alternative Treatment to CPAP: Devices***
10:25 am – 10:45 am	**Break**	**Sponsored by Idorsia Pharmaceuticals**
10:45 am – 11:45 am *WPU Assembly Room*	**DAVID J. KUPFER KEYNOTE LECTURE**	
	Keynote Lecturer:	**Wendy Troxel, PhD** Senior Behavioral and Social Scientist RAND Corporation ***The Social Side of Sleep: How Relationships, Communities, and Policies Shape Our Sleep***
11:45 am – 12:45 pm *Kurtzman Room*	**Lunch**	**Sponsored by ResMed Corporation**

12:45 pm – 2:00 pm
WPU Assembly Room

Panel Discussion
SCHOOL START TIMES

Chair: **Michelle Stepan, PhD**
Assistant Professor of Psychiatry

Panelists: **Wendy Troxel, PhD**
Senior Behavioral and Social Scientist
RAND Corporation

Joanna Fong-Isariyawongse, MD
Associate Professor of Neurology

John Thornton, PhD, NCSP
Director of Student Services
Hampton Township School District

Karen Coyne DPN, RN, CSN
Assistant Professor of Nursing

Deanna Philpott, MA
School Wellness Consultant

2:00 pm – 2:20 pm

Break **Sponsored by Jazz Pharmaceuticals**

2:20 pm – 3:00 pm
WPU Assembly Room

TICA HALL DATA BLITZ

Chair: **H. Matthew Lehrer, PhD**
Assistant Professor of Psychiatry

3:00 pm – 4:30 pm
WPU Ballroom

Poster Session/Networking Reception – Sponsored by Axsome Pharmaceuticals and Inspire Medical Systems

Co-Chairs: **Christopher Kline, PhD**
Associate Professor of Health and Human Development

Karen Jakubowski, PhD
Assistant Professor of Psychiatry

Presenters are expected to stand by their posters during these times:
Odd numbered posters: 3:00-3:30
Even-numbered posters: 3:30-4:00

4:30 pm – 4:45 pm
WPU Ballroom

Awards & Closing Remarks

Jonna Morris, PhD, RN
Assistant Professor of Health and Community Systems
University of Pittsburgh
School of Nursing

DATA BLITZ

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3	Xie, Yuxi yuxix@andrew.cmu.edu	Links Between Discrimination and Sleep Quality: The Mediating Role of Negative Affect
4	Thomas, Mark mark.thomas2@va.gov	CBT-I Improves Multidimensional Sleep Health in Veterans with and without Obstructive Sleep Apnea
5	Tarantine, Catherine catherinet@upmc.edu	Prevalence of Mental Health Conditions and Traumatic Brain Injury among Veterans with Sleep Disorders
6	Stowe, Taylor stowet@upmc.edu	Circadian Rhythms in Neural Mechanisms Underlying Reward-Related Behaviors
7	Scott, Madeline scottmr4@upmc.edu	Cell Type-Specific Circadian Rhythms in the Aging Dorsolateral Prefrontal Cortex
8	Jiang, Larry ruitongj@andrew.cmu.edu	Relationship between Prolonged Process and Rapid Neurobehavioral Responses in Macaques Model
9	Harris, Nicholas harrisna@upmc.edu	Proximal associations between alcohol use behaviors and EEG sleep characteristics in young adults who binge drink
10	Clay, Abby AMC374@pitt.edu	Associations Between Self-Compassion and Sleep Among Midlife Women
11	Chappel-Farley, Miranda chappelfarleymg@upmc.edu	Moderate-to-vigorous physical activity moderates the relationship between non-rapid eye movement sleep slow wave activity and executive function in older adults
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UNIVERSITY OF PITTSBURGH
Center for Sleep and Circadian Science

Abstracts

Presenter Name/Degree(s): Adrianna I. Acevedo-Fontanez, PhD, MS

Current Position: Postdoctoral Scholar

Title: Reallocation of Sedentary Time with Light Physical Activity is Associated with Higher Sleep Efficiency in African Caribbeans

Author(s): Acevedo-Fontánez AI[1], Cvejkus, RK[1], Hawkins, M. [1], Kuipers, AL[1], Marron MM[1], Zmuda, JM[1], Barinas-Mitchel[1]l, E, Wheeler V[2], and Miljkovic, I[1]

Affiliation(s): [1]University of Pittsburgh, [2]Tobago Health Studies Office, Scarborough, Tobago, Trinidad & Tobago

Introduction: Sleep efficiency (or sleep continuity, i.e., a ratio of time spent sleeping to time spent in bed), is inversely associated with hypertension, impaired glucose metabolism, CVD risk, and mortality risk. Prolonged sedentary behavior and physical activity are independently associated with sleep efficiency. However, it is not well documented how substituting time in sedentary behavior with physical activity affects sleep efficiency, especially among African-ancestry populations, who are at high risk for CVD.

Aim: To determine if displacement of sedentary time with activity was cross-sectionally associated with higher sleep efficiency among African Caribbean men (n=235) and women (n=673) from the Tobago Health Study.

Methods: Sleep efficiency, sedentary behavior (SB), light physical activity (LPA), and moderate to vigorous physical activity (MVPA) were collected using a SenseWear Pro Armband. Participants wore the armband at all times, except in water, for 4-7 days. We used the Isotemporal Substitution Framework paired with linear regression to examine associations of SB, LPA and MVPA with sleep efficiency adjusting for age, education, BMI, hypertension, diabetes, smoking, alcohol consumption, caffeine intake, and sleep medication.

Results: Men (mean age ± Standard deviation: 63.2 ± 8.2 years; mean BMI 28.2 ± 4.8 kg/m^2) spent on average less time in SB (12.4 ± 2.9 hours/day) and more time in LPA (4.7 ± 2.1 hours /day) and MVPA (0.92 ± 0.88 hours/day) than women (mean age 55.6 ± 8.7 years; mean BMI 31.8 ± 6.4 kg/m^2) (all p-vales <0.001). Men had lower sleep efficiency (74.6% ± 10.4) than women (81.2% ± 0.96; p-value <0.001). Cross-sectionally reallocating 1 hour of SB with LPA was associated with a 1% higher sleep efficiency (p-value=0.013) in men and with a 0.38% higher sleep efficiency in women (p-value=0.065). In men, reallocating 1 hour of SB with MVPA and 1 hour of LPA with MVPA were significantly associated with lower sleep efficiency [-1.9% (p-value=0.013) and -2.8% (p-value=0.004), respectively]; in women these associations were not statistically significant. Interaction term for sex and sleep efficiency was statistically significant (p-value <0.0001).

Conclusion: In this population with short sleep duration, reallocating 1 hour of SB with LPA was associated with higher sleep efficiency in both genders. In contrast, among men only, reallocating 1 hour of SB to MVPA and 1 hour of LPA to MVPA were unexpectedly associated with lower sleep efficiency. Further research is warranted to understand these relationships longitudinally to determine how truly replacing SB for activities of different intensities impacts sleep health, which could then potentially inform lifestyle guidelines in older Caribbeans. In this highly sedentary population, interventions aimed at increasing LPA may be easier to implement and maintain and provide greater sleep and overall health benefit.

Funding Source: This research was supported by grants R01-DK097084 and R01-HL143793 from the NIH. AIAF supported by CVD T32 Training grant NHLBI T32 HL083825-11, T32 HL082610

Presenter Name/Degree(s): Priya Borker, MD

Current Position: Clinical Assistant Professor of Medicine

Title: Increased immune activation following acute sleep deprivation in people with HIV on ART

Author(s): Priya V. Borker MD[1], Benjamin Morris, BS[2], Jennifer Roscher, BS[2], Steven Swanger RPSG[3], Sanjay R. Patel, MD3, Bernard J, Macatangay, MD[2]

Affiliation(s): [1]Division of Pulmonary, Critical Care, and Sleep Medicine, University Hospitals Cleveland Medical Center, 11100 Euclid Ave, Cleveland, OH, 44106, USA.

[2]Division of Infectious Diseases, University of Pittsburgh School of Medicine, Pittsburgh, Pennsylvania, United States of America3

[3]Division of Pulmonary Allergy and Critical Care Medicine, University of Pittsburgh 3609 Forbes Avenue, 2nd Floor, Pittsburgh, PA, 15213, USA.

Introduction: Sleep disturbances are prevalent in people with HIV (PWH). The immunosuppressive adenosine (ADO) pathway is induced by inflammation and is integral in mediating homeostatic sleep drive. Dysregulation of the pathway exists in PWH. We evaluated the effects of acute sleep deprivation on the levels of immune activation and inflammation and determined whether it results in a compensatory increase in the expression of ectoenzymes responsible for extracellular ADO generation to mediate sleepiness and decrease inflammation.

Methods: Twenty PWH (75% men) who have been virally suppressed on antiretroviral therapy for at least one year underwent one week of regularized sleep with at least 8 hours opportunity to sleep each night followed by 24 hours of sleep deprivation (SD). Blood was obtained pre- and post-SD to measure levels of T cells activation (HLA-DR+CD38+), cell cycling (Ki-67+), and T-cell ectoenzyme expression (CD39; CD73) using flow cytometry. Plasma levels of soluble inflammatory markers (IL-6, sCD14, sCD163) were measured using a multiplex assay.

Results: Participants had a median (IQR) age of 59.7(58.6,63.5) years and CD4 of 760(678,883) cells/mm^3. Levels of CD8+ T cell immune activation increased post-SD (median 8.6% to 9.4%; p=0.05, paired t-test). There were no differences in CD4+ T cell activation. In contrast, cell cycling post-SD decreased in both CD8+ (88.0% to 80.8%, p=0.03) and CD4+ (90.3% to 83.5%; p=0.02) T cells. There was a trend for increased sCD163 post SD (3587 to 3838 ng/mL, p=0.08), but no differences were observed in IL-6 and sCD14 . Despite increases in CD8+ T cell activation, we did not observe compensatory increases in the expression of CD39 and/or CD73 on CD8+ or CD4+ T cells. Decreased CD73 expression on CD8+ T cells post SD was associated with increased CD8+ activation (Spearman ρ= 0.76, p <0.005) and a trend toward increased CD8+ cycling (ρ=-0.43, p=0.14) but not with measures of CD4+ T cell activation (p=0.49), cycling (p=0.18) or changes in sCD14 (p=0.33), CD163 (p=0.44) or IL-6 (p=0.25).

Conclusion: Our results suggest that among virally suppressed PWH, sleep deprivation could impact systemic inflammation by activation of CD8+ T cells and macrophages. However, there is no compensatory increase in ectoenzyme expression that can increase extracellular adenosine and counteract the inflammatory process.

Funding Source: R01 HL142118, T32 Translational Research Training in Sleep Medicine NIH/NHLBI HL082610-13, K12 Pittsburgh HIV Mentored Training for Investigation of Co-morbidities and Cure (HIV MeTrICC) HL143886, K23 HL169022

Presenter Name/Degree(s): Omeed Chaichian, BS

Current Position: Research Specialist

Title: Sleep disturbances in bipolar disorder patients across mood states: A systematic review and meta-analysis

Author(s): Omeed Chaichian[1], Ahmad Mayeli[1], Mattia Marchetti[2], Claudio Sanguineti[2], Francesco L. Donati[1,2], Allison Kim[1]. Katerina Piskun[1,3], James D. Wilson[4], Mary L Phillips[1], Fabio Ferrarelli[1]

Affiliation(s): [1]Department of Psychiatry, University of Pittsburgh, USA [2]Department of Health Sciences, University of Milan, Italy [3]Department of Neuroscience, University of Pittsburgh, USA [4]Department of Mathematics and Statistics, University of San Francisco

Introduction: Abnormal sleep is a pivotal feature of bipolar disorder (BD). However, the severity and occurrence of sleep disturbances in BD, including across different mood states (i.e., euthymia, depressive, and manic/mixed state), have not been characterized.

Methods: Web of Science and PubMed were searched between inception and February 1st, 2024. Sleep disturbance prevalence and case-control studies were included. This meta-analysis (PROSPERO; CRD42023420519) followed PRISMA 2020 guidelines. Mood state-specific and pooled random-effects meta-analyses were conducted.

Results: Sixty-one studies with 3107 cases for prevalence and 2741 cased and 3218 controls for case-control studies were selected. Sleep disturbance prevalence was 63%(95%CI=52-73%) in pooled cases and 55% (95%CI=39-69%) in euthymic patients. Sleep quality was worse in pooled cases vs. controls (standardized mean difference, SMD=1.02,95%CI= [0.82-1.05]). Sleep duration and continuity parameter alterations included: higher total sleep time (TST) in pooled (SMD=0.30[0.08-0.52]) and euthymia (SMD=0.45[0.24-0.66]), but lower TST in manic/mixed state (SMD=-0.74[-1.4to-0.09]); higher sleep onset latency (SOL) in pooled (SMD=0.36[0.20-0.53]), euthymia (SMD=0.42[0.20-0.64]), and manic/mixed state (SMD=0.38[0.08-0.67]); lower sleep efficiency (SE) in pooled cases (SMD=-0.30[-0.79to-0.10]), euthymia (SMD=-0.27[-0.53to-0.01]), and manic/mixed state (SMD=-1.04[-1.41to-0.67]); higher wake after sleep onset (WASO) in pooled cases (SMD=0.27[0.09-0.44]), euthymia (SMD=0.26[0.03-0.50]), and depressive state (SMD=0.26[0.01-0.51]); higher number of awakening in pooled cases (SMD=0.36[0.09-0.64] and euthymia (SMD=0.39[0.09-0.68]); higher TST variability in pooled cases (SMD=0.36[0.21-0.51]) and euthymia SMD=0.36[0.12-0.61]); higher SOL variability in euthymic patients (SMD=0.41[0.07-0.76]); and higher WASO variability in pooled cases (SMD=0.29[0.02-0.56]) and euthymia (SMD=0.49[0.14-0.84]). Regarding sleep architecture, REM percentage in pooled cases (SMD=0.39[0.06-0.72]), depressed patients (SMD=0.51[0.04-0.98]), and REM density in pooled cases (SMD=0.68[0.13-1.23]) were higher in BD vs. HC subjects.

Conclusion: Sleep disturbances are highly prevalent in BD, including during euthymia. Furthermore, both shared and distinct abnormalities in sleep parameters occur in BD patients across mood states. Sleep should therefore be regarded as a central clinical target and research domain for BD.

Funding Source: R01MH130376

Presenter Name/Degree(s): Miranda G. Chappel-Farley, PhD

Current Position: Postdoctoral Scholar

Title: Moderate-to-vigorous physical activity moderates the relationship between non-rapid eye movement sleep slow wave activity and executive function in older adults

Author(s): Miranda G. Chappel-Farley, Rima F. Habte, Mary E. Fletcher, Michelle E. Stepan, Kristine A. Wilckens

Affiliation(s): Center for Sleep and Circadian Science, Department of Psychiatry, University of Pittsburgh

Introduction: Moderate-to-vigorous physical activity (MVPA) and sleep are associated with better cognitive function in older adults. Preliminary evidence suggests that MVPA and sleep interact in their association with cognition, with some studies suggesting that MVPA protects cognitive function under conditions of poor sleep. However, these relationships have primarily been examined using global sleep measures like sleep continuity and duration. Sleep microstructure, including non-rapid eye movement sleep slow wave activity (NREM SWA), which promotes synaptic homeostasis and the clearance of neurometabolic waste, is consistently tied to better cognitive function. Whether MVPA influences the associations between SWA and executive function in older adults has yet to be determined. The current study examined whether MVPA moderates the relationship between SWA and executive function in older adults.

Methods: A sample of 85 cognitively healthy older adults (μ_{age}=68.8±5.8, 60.0 % Female) participated in one of three overnight sleep research studies at the University of Pittsburgh. All participants completed a baseline 7-day sleep diary including self-reported physical activity duration across light, moderate, and vigorous intensity levels. Total self-reported duration of MVPA was calculated, and median split was used to create high/low MVPA groups. Electroencephalography (EEG) with polysomnography (PSG) was recorded during overnight sleep. Power spectral density estimates for slow wave activity (SWA; 0.5-4Hz) were calculated for F3 and F4 derivations. The morning after the overnight sleep study, participants performed a computerized task-switching paradigm assessing executive function. Participants performed two single task blocks (judge whether a number is greater than or less than 5 or just whether the number is odd or even) and a switching block in which they were cued on each trial to perform one of the two tasks. Hayes SPSS Process Macro was used to perform moderation analyses to examine whether MVPA influenced the relationship between frontal SWA and task-switching performance, controlling for age, sex, years of education, and protocol.

Results: We found a significant interaction between MVPA and frontal relative SWA (β= -2.84, p=0.006), such that MVPA significantly moderated the relationship between SWA and single task accuracy. When the interaction was probed, older adults who reported lower levels of MVPA exhibited a positive relationship between SWA and single task accuracy (p=0.11), whereas older adults reporting higher levels of MVPA exhibited a negative relationship between SWA and single task accuracy (p=0.02). Similar trend-level relationships were found within the switching block for accuracy on repeat trials (β= -3.42, p=0.06, N=85).

Conclusion: These findings suggest that greater levels of SWA support better executive function in older adults engaging in less physical activity. Counterintuitively, older adults who engaged in greater MVPA exhibited poorer performance with greater SWA. Published studies have shown weaker sleep-cognition associations at higher levels of MVPA, suggesting physically active older adults may need to rely less on sleep to support cognition, perhaps due to other MVPA-related neurophysiological adaptations. Our results suggest that at high levels of MVPA, changes in SWA may have a more complex relationship with cognition, which has important implications for personalized interventions aimed at preserving cognition in late life. Future work in larger samples with longitudinal and experimental designs should explore these possibilities.

Funding Source: This study was funded by NIH grants (R01 AG068001; K01 AG049879) (PI: Wilckens), and New Vision Research, and the University of Pittsburgh Aging Institute (PI: Wilckens). MGCF was supported by T32HL082610 (MPIs: Buysse, Franzen). MES was supported by K01 MH130502 (PI: Stepan).

Presenter Name/Degree(s): Alison Y. Choi, BS

Current Position: Medical Student (M3)

Title: The efficacy of hypoglossal nerve stimulation therapy in patients with coexisting pulmonary diseases

Author(s): Alison Y. Choi, BS[1]; Rachel L. Whelan, MD[1]; Mazen El Ali, MD[2]; Ryan J. Soose MD[1*]; Thomas M. Kaffenberger, MD[1,3*] (*Co-Senior Authors)

Affiliation(s): [1]Department of Otolaryngology, University of Pittsburgh Medical Center, Pittsburgh, PA
[2]Division of Pulmonary, Allergy, Critical Care, and Sleep Medicine, UPMC, Pittsburgh, PA
[3]Veterans Affairs Pittsburgh Healthcare System, Pittsburgh, PA

Introduction: Hypoglossal nerve stimulation (HGNS) is becoming a commonly utilized surgical treatment for patients with moderate-to-severe obstructive sleep apnea (OSA) who are intolerant to continuous positive airway pressure (CPAP). We aim to assess whether OSA patients with comorbid pulmonary diseases including asthma, chronic obstructive pulmonary disease (COPD), and hypoventilation syndromes also benefit from Hypoglossal S and if there are differences in response compared to those without pulmonary comorbidities.

Methods: A single-center retrospective review of 229 patients with OSA who underwent HGNS implantation in 2011-2021 was performed. Patients were categorized into OSA alone (OSAa) and OSA with pulmonary comorbidities (OSAp). Those without postoperative polysomnography data and OSAp patients missing pulmonary function tests were excluded. Demographics, pre and 6-12-month postop polysomnography data, subjective daytime sleepiness scores, and adherence data from device downloads were collected. Analysis was performed with nonparametric paired and unpaired t-tests using Prism 10.

Results: There were 103 OSA-A patients and 28 OSA-P patients. Of the OSA-P patients, 64% had asthma, 57% had COPD, 32% had both asthma and COPD, and 43% had a component of hypoventilation. BMI pre- and post-implantation and device adherence were not significantly different between groups. OSA-A apnea-hypopnea index (AHI), Epworth Sleepiness Scores (ESS), oxygen (O2) nadir, and T90 significantly improved after implantation ($p< 0.0001$ for all). OSA-P AHI ($p<0.0001$), ESS ($p=0.0002$), and O2 nadir ($p=0.0095$) significantly improved after implantation. Change in O2 nadir was significantly greater in OSA-A patients compared to OSA-P (+6.1%, +2.6%; $p=0.045$), but there was no significant difference in change in AHI, ESS, and T90 between the two groups.

Conclusion: Our study supports HGNS as an effective alternative for OSA-P patients. Similar improvement in OSA metrics was observed between patients with and without pulmonary comorbidities. The difference in O2 nadir, however, may warrant further investigation.

Funding Source: None

Presenter Name/Degree(s): Abby Clay

Current Position: Undergraduate student

Title: Associations Between Self-Compassion and Sleep Among Midlife Women

Author(s): Alana Castle, B.S. [1], Mary Y. Carson, M.S. [2], Karen Jakubowski, PhD[1], Caitlyn Johnson, B.A.[1], Abby Clay[1], Pauline Maki, PhD[3], Rebecca C. Thurston, PhD[1,2,4]

Affiliation(s): [1]Department of Psychiatry, University of Pittsburgh School of Medicine; [2]Department of Psychology, University of Pittsburgh; [3]Department of Psychiatry, University of Illinois at Chicago, [4]Department of Epidemiology, University of Pittsburgh

Introduction: Sleep quality plays a critical role in health. Positive psychological states, such as self-compassion, may be associated with improved sleep quality. Self-compassion is characterized by being mindful of one's moment-to-moment experience and treating oneself with kindness and compassion. Self-compassion may also be associated with better mental health, which in turn may have implications for sleep. We tested whether greater self-compassion was associated with improved subjective sleep among midlife women. We additionally considered the role of depressive symptoms in these associations.

Methods: Participants were 274 midlife women aged 45-67. Women completed validated measures of self-compassion (Self-Compassion Scale-Short Form), sleep quality (Pittsburgh Sleep Quality Index), insomnia symptoms (Insomnia Severity Index), and depressive symptoms (Center for Epidemiological Studies-Depression); reported medical history and medication use via interview; and provided physical measures of height/weight (body mass index; BMI). Relations between self-compassion and subjective sleep (greater sleep quality, lower insomnia symptoms) were assessed in separate linear regression models, adjusting for age, race/ethnicity, education, sleep apnea symptoms, sleep medication use, and physiologic vasomotor symptoms during sleep. Depressive symptoms were evaluated as a mediator using the products of coefficients method.

Results: Women were on average 59 years old; 99% were postmenopausal; 78% identified as white, 18% Black, 2% Asian or Pacific Islander, and 2% Multiracial. Women who reported greater self-compassion had better sleep quality [B(SE)= -0.03(.006), $p<0.001$, multivariable] and fewer symptoms of insomnia [B(SE)= -0.22(.08), $p=.007$, multivariable] and depression [B(SE)= -0.11(.01), $p<0.001$, multivariable] (Figure 1). Depressive symptoms were a significant mediator of associations between self-compassion and sleep quality or insomnia, respectively, such that 70%-82% of the relationship between self-compassion and sleep outcomes was explained by lower depressive symptoms among women with higher self-compassion.

Conclusion: Greater self-compassion was associated with better sleep quality, lower insomnia symptoms, and fewer depressive symptoms, after adjusting for confounders. Future research should test whether interventions to enhance self-compassion can improve mental health and sleep among midlife women, and clinicians may consider approaches that enhance self-compassion when treating poor sleep and depression in midlife women.

Funding Source: RF1AG053504 and R01AG053504 (RCT & PMM); K24HL123565 (RCT)

Presenter Name/Degree(s): Kayla Conaty B.A.

Current Position: Research Coordinator

Title: Subjective Cognitive Concerns as Predictors of Cognitive Performance, and the roles of Sleep Quality and Daytime Sleepiness Among Older Adults

Author(s): Kayla Conaty[1], Erin McCarty[2], Karl Rennick-Zuefle[3], Josh Yeoum[1], Dan J. Buysse[4], Meryl A. Butters[4], H. Mathew Lehrer[4]

Affiliation(s): Western Psychiatric Hospital, UPMC[1]; Department of Neuroscience, University of Pittsburgh[2]; Department of Biological Sciences, University of Pittsburgh; Department of Psychiatry, University of Pittsburgh School of Medicine[4]

Introduction: Sleep quality and daytime sleepiness affect cognitive performance, particularly in older adults. Subjective cognitive concerns (SCC) may serve as indicators of objective cognitive impairments. Poor sleep, excessive daytime sleepiness, and elevated levels of SCC are associated with cognitive impairments across various domains. Understanding these relationships is helpful for identifying individuals at risk for cognitive decline and developing potential sleep-based interventions. This analysis examines the relationship between SCC and objective cognitive performance among individuals with varying sleep quality and daytime sleepiness.

Methods: Participants (N=60; mean age=67.9±4.7; 60.7% females; 13.1% non-white) were 30 retired day shift workers (RDSW) and 30 retired night shift workers (RNSW). Participants completed a neuropsychological battery assessing immediate and delayed memory, executive function, attention, language, and visuospatial ability; self-reported measures of global cognitive function (Everyday Cognition Scale [eCog-39]); self-reported sleep (Pittsburgh Sleep Quality Index [PSQI]); and daytime sleepiness (Epworth Sleepiness Scale [ESS]). This secondary analysis stratified participants based on the upper and lower 50% of PSQI and ESS scores, with lower scores indicating better sleep quality and less daytime sleepiness, respectively. Linear regression models were used to assess the interaction between subjective cognitive concerns (SCC) on the eCog-12 and performance on cognitive measures, comparing groups from both the PSQI and ESS analyses. Cognitive measures were age-adjusted using validated normative data. Models were adjusted for sex and education.

Results: SCC predicted objective executive function task scores in participants with poor sleep quality (B=-0.804, SE=0.32, p=0.021), but not in those with good sleep quality (B=-0.004, SD=0.458, p=0.994). A trend toward significance was observed between SCC and delayed memory in the poor sleep quality group (B=-0.504, SE=0.28, p = 0.081), but not in the better sleep quality group (B=-0.292, SE=0.51, p= 0.574). No significant associations between sleep and performance were found for attention, language, immediate memory, and visuospatial ability in either group.

Among participants with higher daytime sleepiness (upper 50% of ESS scores), the interaction between SCC and executive function (B=-0.616, SE=0.31, p=0.0595) and between SCC and delayed memory (B=-0.512, SE=0.31, p=0.107) approached statistical significance. In contrast, no significant associations were found in the lower ESS group for executive function (B=-0.324, SE=0.53, p=0.547) or delayed memory (B=-0.141, SE=0.52, p=0.789). As with the PSQI groups, no significant relationships were found for attention, language, immediate memory, or visuospatial ability in either group.

Conclusion: Self-reported sleep disturbances and daytime sleepiness may impact cognitive processes crucial for everyday functioning. Individuals with poor sleep quality seem more capable of predicting their cognitive impairment through subjective measures. Assessing cognitive complaints through self-reports could aid in identifying objective impairments, particularly in individuals with worse sleep quality and higher daytime sleepiness. Interventions targeting sleep improvement may help mitigate declines in executive functioning and delayed memory, thereby improving overall cognitive performance.

Funding Source: R01AG047139, R01AG047139-S1

Presenter Name/Degree(s): Carlos Cruz - M.S. Biomedical Engineering

Current Position: Doctoral Student Researcher

Title: Circadian Blood Pressure Trends in a Healthy Sample: Implications for Ageing and Sleep

Author(s): Carlos Cruz[1,2], John Ashley[1,2], Rong Zhang[1,2]

Affiliation(s): Institute for Exercise and Environmental Medicine, Dallas, TX, USA[1]
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Introduction: Sleep is an important mediator in circadian blood pressure (BP) trends such as nocturnal BP dipping and morning blood pressure surge (MBPS). Accelerometry and 24-hour ambulatory blood pressure monitoring (ABPM) are among the best methods to measure sleep health and circadian BP, respectively. However, there is limited circadian literature reporting both accelerometer-measured sleep and ABPM, with research often focusing on a single age group. We employed both these methods in a sedentary sample with healthy sleep patterns to investigate the cross-sectional effects of sleep quality and ageing on circadian BP trends.

Methods: Participants: Adults with no major clinical conditions (e.g. Diabetes, Parkinson's) and with a resting systolic blood pressure (SBP) < 140 and otherwise healthy, participated.

Accelerometry: Participants wore accelerometers (ActiCal, Phillips Respironics, USA) on the waist continuously for 1 week. Participants with less than 3 days of valid wear time were excluded. Participants were excluded if physically active (> 4.0 metabolic equivalents) for more than 90 minutes per week. Actilife software (version 6.13.6, Actigraph LLC, USA) was used to compute sleep quality metrics including total sleep time (TST) and midpoint time (MT) in hours.

ABPM: Participants wore the Oscar 2 model ABPM device for 24 hours and data was processed in the AccuWin Pro software (version 3.4.0, Suntech Medical, USA). Participants with > 90 mmHg of mean wake diastolic BP were excluded. Metrics included systolic MBPS (%) and rate of rise (mmHg/hr) from 2 hours pre-wake to 2 hours post-wake. SBP dipping was also calculated from ABPM data, with participants grouped into dippers (SBP dipping > 10%) and non-dippers (SBP dipping ≤ 10%).

Results: 68 participants remained after screening**.** The sample was 63% female, with age groups young/middle age (< 60 yrs; n =35) and elderly (≥ 60 yrs; n = 33). 46 participants were nocturnal dippers and 22 were non-dippers. The average TST (9.3 hrs ± 0.9) was indicative of a healthy sample. T-test revealed greater MBPS (%) in dippers compared to non-dippers ($p << 0.05$; CI: 8.2%,12.8%). Age did not correlate significantly with any MBPS or BP dipping metrics. In the full sample, SBP dipping was significantly correlated with both MBPS (%) and rate of rise (MBPS: $r = 0.37$; $p << 0.05$; CI: 0.15,0.56).

Conclusion: Significant correlation of SBP dipping with MBPS, as well as MBPS differences among dipper/non-dipper groups supports existing evidence that MBPS and BP dipping are connected. A lack of age-related associations with MBPS in a sample with healthy sleep patterns implies good sleep can protect against age-related decline of circadian BP trends. Further studies should investigate possible interactions of physical activity and compare the present outcomes with those of unhealthy sleepers (e.g. sleep apnea patients) and those with varying degrees of hypertension.

Funding Source: NIH Project #: 5R01HL102457-02, PI: Dr. Rong Zhang

Presenter Name/Degree(s): Yue (Coco) Dong, RN

Current Position: Graduate Student Researcher/ PhD candidate

Title: Sleep Stage-Dependent Impact of Sleep Disordered Breathing on Cognition: A Conceptual Framework and Protocol

Author(s): Yue Dong[1], Jonna L. Morris[1], Kristine A. Wilckens[2]

Affiliation(s): 1) University of Pittsburgh School of Nursing; 2,) University of Pittsburgh School of Medicine, Department of Psychiatry

Introduction: The relationship between sleep disordered breathing (SDB) and cognitive decline is controversial. Previous studies have shown conflicting results regarding the effects of treating SDB on cognition. These studies have not accounted for differences in SDB as a function of sleep stage. SDB has been shown to be more severe during rapid eye movement (REM) sleep in some populations due to complete muscle atonia. Moreover, adherence to treatment is often worse later in the night when REM sleep predominates. This conceptual framework proposes that the impact of sleep disordered breathing on cognition is sleep stage-dependent.

Methods: Using a new device (Sleep Image) to capture respiratory events during REM and NREM sleep, subjective reports of cognitive decline, and electronic momentary assessments of cognition (M-path mobile app) over 15 days, I will characterize the association between sleep and cognition through two major pathways: 1) Primary hypothesized pathway: SDB is more strongly associated with cognition during REM than NREM sleep; 2) Secondary pathway: The association between non-SDB-related sleep disruption will be stronger for NREM sleep, in line with the established literature.

Results: Recruitment is ongoing. Participants have adhered to the protocol for Sleep Image wear and MPath testing. Preliminary data on the relationship between subjective cognitive decline and SDB variables in NREM vs REM will be discussed.

Conclusion: This will be among the first studies to disentangle the impact of REM and NREM SDB on cognition. It additionally has the strength of examining night to night changes using momentary assessments. Given that adherence to SBD treatment decreases over the course of the night when REM sleep is highest, these results have potential to impact a large field of study examining the effects of SDB in cognitive aging, Alzheimer's disease and related dementias.

Funding Source: Newmeyer-Thompson Doctoral Award and the Juliana Shayne Research Fund

Presenter Name/Degree(s): Caroline Doyle, PhD

Current Position: Postdoctoral Scholar

Title: Associations between Childhood Trauma Exposure and Insomnia Symptom Trajectories in Midlife Women

Author(s): Caroline Doyle, Yuefang Chang, Howard Kravitz, Nancy Avis, and Rebecca Thurston

Affiliation(s): University of Pittsburgh, Rush University, Rush University Medical Center, Wake Forest University School of Medicine

Introduction: Though emerging evidence indicates that childhood trauma history is related to insomnia symptoms in adulthood, this literature is largely limited to single time point analyses. The current study seeks to assess the relationship between multiple subtypes of childhood trauma exposure and insomnia symptom trajectories in a large, diverse sample of midlife women.

Methods: Participants were part of the Study of Women's Health Across the Nation (SWAN). A multiethnic sample of 3,302 US women ages 42-52 years at baseline (1996-1997) were followed annually for up to 21 years. They completed the Childhood Trauma Questionnaire at Visit 15 and questionnaires on sleep problems annually. At each study visit, participants reported the frequency of three sleep problems over the past 2 weeks: trouble falling asleep, waking up several times a night, and waking up earlier than planned and unable to fall asleep again. Each of these frequency responses was dichotomized as no/infrequent (≤2 times per week) or yes (≥3 times per week). Insomnia symptom trajectories (i.e., reporting ≥1 sleep problem ≥3 times per week versus not) were characterized across 16 SWAN visits. Group based trajectory modeling was used to derive insomnia trajectories. Covariates included age, race, education, study site, financial strain, baseline menopause status, smoking status, BMI, and insomnia medication use. Sensitivity analyses accounted for depressive symptoms and obstructive sleep apnea risk, respectively.

Results: Four trajectories of insomnia symptoms were identified: consistently low (38% of cohort), increasing (21%), moderate/decreasing (19%), and consistently high (21%) insomnia symptoms over 21 years. 52.1% of the sample endorsed experiencing any childhood trauma. Multinomial logistic regression showed that compared to the "consistently low" insomnia symptom group, women who reported exposure to any childhood trauma had 34%, and 87% higher odds of being in the "moderate/decreasing" and "consistently high" insomnia symptom groups, respectively, after adjusting for covariates. Specifically, physical and sexual abuse continued to predict belonging to the "moderate/decreasing" and "consistently high" insomnia symptom groups after adjusted for covariates and depression. These results were replicated with physical and sexual abuse questions from Visit 12.

Conclusion: Childhood trauma exposure, particularly childhood physical and sexual abuse, is associated with higher likelihood of chronic insomnia symptoms in women throughout midlife into older age.

Funding Source: SWAN: (grants U01NR004061, U01AG012505, U01AG012535, U01AG012531, U01AG012539, U01AG012546, U01AG012553, U01AG012554, U01AG012495, and U19AG063720); CBM T32: T32HL007560-38

Presenter Name/Degree(s): Kendrea Garand, PhD, CScD, CCC-SLP, BCS-S

Current Position: Associate Professor

Title: Surgical Complications in Anterior Cervical Discectomy and Fusion in Patients with Obstructive Sleep Apnea – A Multi-National Large Database Study

Author(s): Zachary D. Urdang MD PhD*[1]; Praneet Kaki BS*[2]; Nitin Agarwal MD[3,4]; Kojo Hamilton MD[3,4]; Sandra Stinnett MD[4,5]; Kendrea L Garand PhD[6]; Maurits Boon MD[7]; Colin

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Introduction: Obstructive sleep apnea (OSA) is an increasingly highly prevalent disorder characterized by repeated episodes of upper airway collapse during sleep leading to oxygen desaturations and arousal. Surgery is also implicated to increase risk of upper airway collapsiblity. Small case series studies have demonstrated increased odds of patients developing obstructive sleep apnea (OSA) after anterior cervical discectomy and fusion (ACDF) surgery, a commonly performed spinal procedure used to treat spinal cord or nerve root decompression within the neck. Our aim was to test the hypothesis that patients with obstructive sleep apnea (OSA) experience greater odds for acute and long-term surgical complications after anterior approach for cervical spine fusion (ACDF).

Methods: Retrospective cohort database study with propensity-score matching (PSM) using TriNetX. Patients who underwent ACDF were identified using CPT codes 22554, 63075, 63076, 1020540, 1022222. Patients were stratified into two cohorts: 1) ACDF-OSA; and 2) ACDF-No-OSA. Odds-ratios (ORs) with 95% confidence intervals (CI) were calculated to determine acute, post-operative incidents, including hematoma/seroma, cellulitis, cervical osteomyelitis/discitis, incision/drainage, hardware removal, esophageal perforation, swallow study completion, and dysphagia. Outcomes were measured at the following post-operative day windows: ≤30 days, 31-90 days, and 90-4,500.

Results: After PSM, we identified 13,760 ACDF patients, which were split equally between the experimental (n=6,880) and control (n=6,880) cohorts. The mean age (years) was 58.0 (SD=10.9), with 55% male patients. There was increased odds of developing hematomas/seromas among ACDF-OSA recipients compared to controls (OR: 2.36, 1.26-4.42, p=0.0073) ≤30 days from surgery. However, all other outcomes were not significant at this time point. Within the 90-4500 day window, no significant differences were noted. However, a trend was observed for odds of dysphagia in the ACDF-OSA group (OR: 1.14; 0.99-1.3, p=0.0895).

Conclusion: Patients with OSA who underwent ACDF experienced higher matched odds for acute, post-operative complications, including neck hematoma/seromas. The increased risk of post-operative complications in this vulnerable patient population raises the awareness of the need for further study to delineate the pathophysiological relationship between OSA and ACDF, screening of appropriate patients, and management strategies to prevent the exacerbation of disease and post-operative morbidity.

Funding Source: Zachary Urdang was supported by the National Institutes of Health institutional training grant T32GM008562 during the time of this work.

Presenter Name/Degree(s): Osea Giuntella, PhD

Current Position: Associate Professor of Economics

Title: Shaping sleep intentions through audio messaging: insights into racial disparities in children's bedtime norms

Author(s): Ilaria Proietti[1], Osea Giuntella[1], Rania Gihleb[1], Wendy Troxel[1,2]

Affiliation(s): University of Pittsburgh[1], Rand Corporation[2]

Introduction: Despite significant advancements in healthcare, racial disparities continue to affect access to care and health outcomes. Sleep, a crucial factor for health and human capital, has been under-explored in the context of racial disparities among children and teenagers. This study uses data from the the American Time Use Survey (ATUS) to examine the role of socioeconomic and demographic factors in explaining these disparities. The analysis reveals notable racial differences in bedtime and sleep duration, with Black children more likely to go to bed later than White children. These differences are only partially explained by factors such as income, parental age, marital status, and night work, suggesting that racial differences in beliefs and norms also play a role. Motivated by these empirical findings, an online experiment was conducted to explore the impact of audio information on sleep recommendations.

Methods: Participants were randomly assigned to hear messages from either a White Caucasian or an African American narrator, with messages delivered either as personal reflections from a mother or in a straightforward, neutral style. Additionally, some messages highlighted racial disparities in sleep patterns.

Results: The results indicate that providing sleep information generally increased participants' intentions to sleep longer, go to bed earlier, establish a sleep routine, and subscribe to a sleep hygiene newsletter. However, the narrator's race and the delivery style did not significantly affect these outcomes. Highlighting racial disparities had a smaller effect compared to simply providing information on sleep guidelines and the importance of sleep for academic success.

Conclusion: Racial disparities in children's sleep patterns persist, with Black children experiencing later bedtimes and shorter sleep duration compared to White peers. Socioeconomic factors partially explain these differences, but cultural factors also play a significant role. Providing general sleep information can improve sleep behaviors, but addressing racial disparities may require more targeted interventions.

Funding Source: Behavioral Economics Design Initiative, University of Pittsburgh

Presenter Name/Degree(s): Chihun Han MD

Current Position: Sleep Medicine Fellow

Title: Impacts of HGNS on Hypoxic Burden

Author(s): Chihun Han MD, Alexander Rothstein BS, Ryan J. Soose MD, Patrick J. Strollo Jr. MD, Thomas Kaffenberger MD

Affiliation(s): University of Pittsburgh

Introduction: Hypoxic burden (HB) is a novel metric used to characterize the physiological impact of obstructive sleep apnea (OSA). Prior studies have shown HB to strongly correlate with cardiovascular (CV) risk. While the hypoglossal nerve stimulator (HGNS) has been shown to effectively reduce AHI, its impact on HB remains underexplored. This study examines the effect of HGNS on subjective and objective outcomes in OSA, including HB.

Methods: We conducted a retrospective review of 72 patients who underwent HGNS and completed home sleep apnea testing (HSAT) before and after surgery at our institution. Data collected included demographics, pre- and postoperative AHI, body mass index (BMI), oxygen desaturation index (ODI), and Epworth sleepiness score (ESS). HB was calculated using the SpO2 signal from sleep studies at baseline and post-optimization of HGNS therapy (The Siesta Group, Vienna Austria). Treatment success was evaluated using the Sher20 criteria, and the paired Wilcoxon test and Wilcoxon Rank Sum Test were used to assess outcomes.

Results: The mean age and BMI of the patients were 64.5 years and 28.7 kg/m², with 76.1% being male. The Sher20 success rate was 52.8%. Statistically significant reductions were seen in AHI (33.1 to 17.8, $p < 0.001$), ESS (11.4 to 7.7, $p < 0.001$), HB (102.5 to 62.9, $p < 0.001$), and ODI (29.5 to 14.8, $p < 0.001$) after HGNS. Significant differences were observed in ODI and HB changes between Sher20 responders and non-responders, while ESS changes were not significantly different.

Conclusion: HGNS resulted in significant improvements in both objective and subjective outcomes of OSA, including HB. These findings suggest that HGNS may be useful in alleviating physiological impacts associated with OSA.

Funding Source: N/A

Presenter Name/Degree(s): Nicholas Harris MD PhD

Current Position: Postdoctoral Scholar, Fellow Physician

Title: Proximal associations between alcohol use behaviors and EEG sleep characteristics in young adults who binge drink

Author(s): Nicholas A. Harris MD PhD, Nina Oryshkewych MS, Daniel Buysse MD, Sarah L. Pedersen PhD, Meredith L. Wallace PhD, Brant P. Hasler PhD

Affiliation(s): University of Pittsburgh

Introduction: Alcohol use disorder (AUD) is associated with significant sleep disturbances, but the specific impacts of acute alcohol exposure, withdrawal, and chronic consumption on sleep architecture remain challenging to disentangle. This study aims to examine the immediate effects of alcohol consumption on sleep electroencephalography (EEG) in heavy-drinking young adults.

Methods: Participants (21-30 years, N=88) who engage in weekly binge drinking completed two nine-day ecological momentary assessment (EMA) protocols, documenting drinking events, followed by in-lab polysomnography (PSG). A negative alcohol breath test was confirmed before PSG. Sleep-wake stages and power spectral analysis were derived from EEG data. Linear mixed-effects models were used to analyze the relationship between the number of drinks consumed during the EMA period and various sleep parameters, adjusting for relevant covariates.

Results: On average, participants reported consuming 17.5±1.0 drinks over 3.0±0.1 days in each 9-day EMA period. Higher alcohol consumption was unexpectedly associated with reduced time awake after sleep onset (WASO, log-transformed, βSTD=-0.17, p=0.028), with no significant changes in sleep efficiency (p=0.06) or sleep onset latency (SOL, p=0.656). Additionally, increased alcohol intake correlated with a higher number of REM periods (log-transformed, βSTD=0.17, p=0.022) and decreased REM fragmentation (log-transformed, βSTD=-0.21, p=0.005), though REM latency remained unchanged (p=0.058). Alcohol consumption was also linked to decreased alpha power (8-12 Hz, log-transformed, βSTD =-0.1, p=0.03), while other measures of sleep architecture and spectral power showed no significant associations (p>0.05).

Conclusion: Contrary to expectations, higher proximate alcohol consumption was associated with improved sleep by several parameters. This may reflect the baseline drinking patterns, age-related resilience, or the acute sedative effects of alcohol. The findings highlight the complex relationship between alcohol and sleep, which could help explain why individuals continue drinking despite known risks. Further analyses will explore these possibilities and consider the broader implications for young adults at risk of developing alcohol use disorder.

Funding Source: T32HL082610, T32MH018951, R01DA044143

Presenter Name/Degree(s): Chloe A. Huston, M.A.

Current Position: Research Specialist

Title: Multimodal Evidence of Mediodorsal Thalamus-prefrontal Circuit Dysfunctions in Clinical High-risk for Psychosis: Findings from a Combined 7T fMRI, MRSI and Sleep Hd-EEG Study

Author(s): Chloe A. Huston[1], Ahmadreza Keihani[1], Francesco L. Donati[1], Sabine A. Janssen[1], Chan-Hong Moon[2], Hoby P. Hetherington[3], James D. Wilson[4], Ahmad Mayeli[1], Fabio Ferrarelli[1]

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Introduction: Reduced mediodorsal thalamus-dorsolateral prefrontal cortex (MDT-DLPFC) resting-state functional MRI (rs-fMRI) connectivity and decreased thalamically generated sleep spindles in DLPFC have been reported in chronic and early course schizophrenia. However, the presence of these alterations, and their relationships with underlying neurotransmission, in clinical high-risk for psychosis (CHR), where early detection can facilitate timely interventions, remains to be established. Here, we investigated thalamo-cortical (dys)function with rs-fMRI, sleep electroncephalography (EEG), and magnetic resonance spectroscopic imaging (MRSI) in CHR vs. healthy control (HC) subjects.

Methods: Thirty-one CHR and thirty-two HC underwent: 1) 7T rs-fMRI; 2) 7T MRSI; and 3) sleep EEG; rs-fMRI connectivity was analyzed seeding whole thalamus (WT) and seven thalamic subsections. GABA/creatine (Cr) and glutamate/Cr were calculated in DLPFC and MDT; sleep spindle duration was computed across all channels. These parameters were compared between groups and correlated within groups. Furthermore, clustering analyses using rs-fMRI connectivity and spindle duration were performed to identify CHR and HC subgroups and predict their working memory (WM) performance. Main outcomes and measures were rs-fMRI MDT-DLPFC connectivity, DLPFC spindle duration, and their associations with DLPFC and MDT GABA/Cr and glutamate/Cr.

Results: CHR showed WT-DLPFC hypoconnectivity (peak cluster [x=+6, y=-42, z=+34], size=349 voxels, p-FDR=0.001), especially involving MDT-DLPFC (peak cluster [x=-2, y=56, z=30], size=3139 voxels, p-FDR<0.001). CHR also had reduced sleep spindle duration in DLPFC (t-stat=-2.64, p=0.010, CI[-0.30 -0.04]). In HC, MDT-DLPFC connectivity correlated with: a) DLPFC glutamate/Cr (r=0.45, p=0.018, CI[0.09 0.70]); b) DLPFC GABA (r=0.49, p=0.014, CI[0.12 0.73]); and c) MDT glutamate/Cr (r=0.43, p=0.025, CI[0.06 0.69]), and spindle duration correlated with MDT glutamate/Cr (r=-0.39, p=0.042, CI[-0.66, -0.02]), whereas these associations were lost in CHR. Additionally, clustering analyses revealed that the cluster with intact rs-fMRI and spindle duration included mostly HC subjects (i.e., 83.33% purity), while the cluster with deficits in both measures consisted almost entirely of CHR individuals (i.e., 91.66% purity) and showed the worst WM performance.

Conclusion: By employing a multimodal imaging approach that included rs-fMRI, sleep EEG, and MRSI assessments, this study demonstrated thalamo-cortical connectivity and spindle deficits in CHR vs. HC subjects, which were associated with glutamate/Cr levels and pointed to distinct alterations in the MDT-DLPFC circuit. Building on these findings, future work combining this multimodal approach with targeted treatment interventions and assessing its downstream effects on cognition will help establish the MDT-DLPFC circuit and related functional measures as biological targets for early, effective interventions in the at-risk state.

Funding Source: National Institute of Mental Health

Presenter Name/Degree(s): Larry Jiang, PhD student

Current Position: Graduate Student

Title: Relationship between Prolonged Process and Rapid Neurobehavioral Responses in Macaques Model

Author(s): Larry Jiang, Julian Low, Darcy Griffin, Doug Weber

Affiliation(s): Neuroscience Institute, Carnegie Mellon University

Introduction: It's widely reported that the patterns of brain activity are different even when the task performance appears to be identical. This variability is often referred to as 'brain activity variability'. This type of variability has been reported on the level of single neurons, ensembles and networks (captured by EEG or fMRI). Studies examining the connection between brain activity variability and cognitive performance have focused mainly on short timescale changes across trials within a session. However, in vitro studies have found that the synaptic strength of neurons shows time-of-day variation that links to the circadian rhythm: an intrinsic clock mechanism that aligns with day-night cycle and normally peaks the physiological state in the afternoon. This finding indicates that brain activity fluctuates on a longer timescale than traditional recording sessions cover. Whether this time-of-day fluctuation entails better behavioral performance at certain times of the day and whether this fluctuation attenuates task-related brain activity variation is still an open question.

Methods: To obtain an estimation of the animals' circadian rhythm, our group obtained continuous, round-the-clock recordings of EEG, physical activity, and core body temperature in three nonhuman primates. Data was recorded for up to 14 days while allowing natural, untethered activity. We then implemented an in-cage training system that allows us to test each animals' vigilance responses at different levels of the circadian arousal state. The vigilance response was quantified by the reaction time of the animals. In addition, we looked at the alpha wave activity in the window of 50 ms ~250 ms before the target onset to evaluate the task-related brain activity and how such activity varied at different sessions around the clock.

Results: During task performance, animals tend to have faster reaction time when they are tested at a time closer to the peak of their circadian rhythm, and they show higher alpha band power 50~250 ms before target onset.

Conclusion: Our finding shows that in non-human primates model, their reaction time and task-related neural activity are modulated by circadian timing, with better performance and greater cognitive preparedness occurring during the circadian peak.

Funding Source: DARPA ADAPTER program (Award Number: FA8650-21-2-7119)

Presenter Name/Degree(s): Caleb Jones

Current Position: Primary Care Accelerated Track Student

Title: Detecting cognition-relevant sleep/wake rhythm disruption among older adults with and without mild cognitive impairment using the myRhythmWatch platform

Author(s): Caleb D. Jones, MS[1], Rachel Wasilko, MPH[2], Gehui Zhang, PhD[3], Katie L. Stone, PhD, MA[4, 6,] Swathi Gujral[2], Juleen Rodakowski, OTD, MS, OTR/L[5], Stephen F. Smagula, PhD[2]

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Introduction: We aimed to: (a) establish the feasibility of characterizing 24-hour sleep/wake rhythm measures using accelerometer data gathered from the Apple Watch in older adults with and without Mild Cognitive Impairment; and (b) examine correlations of these sleep/wake rhythm measures with neuropsychological test performance.

Methods: Of 40 adults enrolled (mean age=67.2, standard deviation (SD)=8.4; 72.5% female), 19 had MCI and 21 had no cognitive disorder (NCD). Participants were provided devices, oriented to the study software (myRhythmWatch or myRW), and asked to use the system for a week. The primary feasibility outcome was whether participants collected enough data to assess 24-hour sleep/wake rhythm measures (i.e., ≥3 valid contiguous days). We extracted standard nonparametric and extended-cosine based sleep/wake rhythm metrics. Neuropsychological tests gauged immediate and delayed memory (Hopkins Verbal Learning Test) as well as processing speed and set-shifting (Oral Trails Parts A and B).

Results: All participants provided sufficient data for sleep/wake rhythm measures, although the mean recording length was somewhat shorter in the MCI group (mean days=7.2 (SD=0.6) for NCD vs 6.6 (SD=1.2)) for MCI. Later activity onset time was associated with worse delayed memory performance ($\beta = -0.28$), and rhythm fragmentation was associated with worse processing speed ($\beta = 0.4$).

Conclusion: Using the Apple Watch-based myRW system to gather raw accelerometer data is feasible in older adults with and without MCI. Sleep/wake rhythms variables generated from this system correlated with cognitive function, suggesting future studies can use this approach to evaluate novel, scalable, risk factor characterization and targeted therapy approaches.

Funding Source: Caleb Jones was supported by T32MH019986. The work presented herein was supported by a grant from the NIA to Stephen F Smagula (R21AG074094) and to Juleen Rodakowski (R01AG056351).

Presenter Name/Degree(s): Lauren S. Keller, B.S.

Current Position: Research Coordinator

Title: Melanopsin-Driven Light Responsivity and Reward Motivation in Young People at Risk for Mania

Author(s): Lauren Keller, BS[1]; Margaret Kuzemchak, MS[1]; Meredith L. Wallace, PhD[1]; Brock Sollie, BS[1]; Nathan Elia, BS[1]; Allison Caswell, BS[1]; Simey Chan, MS[1]; Brant P. Hasler, PhD[1]; Kathryn Roecklein, PhD[2]; Adriane M. Soehner, PhD[1]

Affiliation(s): [1]University of Pittsburgh, Department of Psychiatry, [2]University of Pittsburgh, Department of Psychology

Introduction: Mania/hypomania involves circadian rhythm disruption and reward dysregulation. Positive affect and motivated behavior are major outputs of the reward system that are, in part, regulated by the circadian clock. Furthermore, prior research supports the role of light. Light is the strongest influence on circadian rhythms in humans, and evidence suggests that those with and at risk for mania/hypomania have a higher sensitivity to light. In addition to rod and cone photoreceptors in the eyes there is a subgroup of cells containing the light-sensitive photopigment melanopsin. In an ongoing protocol, we examined the extent to which higher melanopsin-driven light responsivity (measured via pupillometry) is associated with greater reward dysregulation in young people at-risk for mania.

Methods: These analyses included 75 participants aged 16-24yr (M=22.0, SD=1.90), recruited across a spectrum of none/low-to-high lifetime mania vulnerability (Mood spectrum Measure-Lifetime Version [MOODS] Mania Scale) in an ongoing study. During a 24-hr lab visit, participants completed morning (AM) and afternoon (PM) testing sessions with assessments of melanopsin-driven pupil responsivity via the post-illumination pupil response (PIPR), reward-based aggression via the Point Subtraction Aggression Paradigm (PSAP), and reward motivation via the Effort Expenditure for Rewards Task (EEfRT). Participants also completed the self-report Behavior Activation Scale (BAS) from which BAS reward sensitivity and frustrative nonreward subscales were derived. PIPR was estimated at 3 post-stimulus intervals, 6sec (PIPR6), 10-30sec (PIPR20), and 10-40sec (PIPR30), and calculated as a percent of baseline to account of individual differences of pupil diameter. Linear and Poisson regression models examined associations between the PIPR and reward-related outcomes (PSAP, EEfRT, BAS subscales). All models covaried for age, sex at birth, past-week depression and mania symptoms, antidepressant use, stimulant use, time spent awake, photoperiod, and minimum pupil diameter for blue light cues, and MOODS mania score.

Results: Lower melanopsin-driven pupil responsivity (PIPR) was associated with greater reward-based aggression (higher PSAP Unprovoked Steals) during both the AM and PM testing sessions. During the AM testing session, PSAP Unprovoked Steals were predicted by PIPR6 (Rate Ratio $[RR]_{PIPR6} = 0.02$, $p < 0.001$), PIPR20 ($RR_{PIPR6} = 0.08$, $p < 0.001$), and PIP30 ($RR_{PIPR6} = 0.08$, $p < 0.001$). RRs < 1 reflect that with each unit increase in the predictor there is a decrease in the outcome by a factor of the RR. During the PM testing session, PSAP Unprovoked Steals was predicted by PIPR20 ($RR_{PIPR6} = 0.06$, $p < 0.001$) and PIP30 ($RR_{PIPR6} = 0.16$, $p = 0.003$) but not PIPR6 ($RR_{PIPR6} = 0.86$, $p = 0.800$). For both the AM and PM testing sessions, there were no significant associations between PIPR outcomes and reward motivation (EEfRT % hard choices) or BAS subscales (all p-values>0.1).

Conclusion: Our interim findings indicate that lower melanopsin-driven pupil responsivity was associated with greater reward-based aggression. While this result stands in contrast to our prediction, it aligns with recent rodent data suggesting that deterioration of melanopsin pathways can contribute to aggressive behavior. Study recruitment is still ongoing, and analyses conducted in the full cohort may allow us to draw a more definitive conclusion on the ties between light sensitivity and reward motivation in young people at risk for bipolar disorder.

Funding Source: National Institute of Mental Health Grant R01MH124828.

Presenter Name/Degree(s): Namhyun Kim, PharmD, MS

Current Position: PhD student in Department of Epidemiology

Title: Associations between Chrononutrition Patterns and Multidimensional Sleep Health

Author(s): Namhyun Kim[1], Rachel Kolko Conlon[2], Samaneh Farsijani[1], Marquis Hawkins[3]

Affiliation(s): [1] University of Pittsburgh, Department of Epidemiology
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Introduction: Sleep health is essential for overall well-being, as poor sleep is associated with increased mortality and higher risks of cardiometabolic and cognitive conditions. Sleep health has been associated with diet quality, but the relationship between chrononutrition patterns and multidimensional sleep health is unclear. This study identifies chrononutrition patterns among U.S. adults and examines their associations with multidimensional sleep health.

Methods: This cross-sectional analysis used data from the 2017-2020 National Health and Nutrition Examination Survey. Chrononutrition behaviors were assessed using one or two 24-hour dietary recalls. Latent Profile Analysis was used to identify chrononutrition profiles. Multivariable survey regression models determined the associations between chrononutrition patterns and sleep health dimensions.

Results: The sample included 5,915 subjects with a median age of 48 years, 52% female, and 65% White. In adjusted models, each additional hour between wake time and first eating was associated with an 18% increase in the odds of poor timing (sleep midpoint <2:00 AM or >4:00 AM; 95% CI: 1.07-1.31) and 19% in poor duration (<7 or >9 hours/night; 95% CI: 1.07-1.31). Each additional hour between last eating and bedtime was associated with 7% higher odds of poor duration (95% CI: 1.01-1.13). A one-hour longer eating window was associated with 7% higher odds of good timing (sleep midpoint 2:00 to 4:00 am; 95% CI: 0.89-0.98). We identified five chrononutrition profiles: Typical Eating (reference), Early Finished Eating, Later Heavy Eating, Extended Window Eating, and Restricted Window Eating. The Early Finished Eating had higher odds of poor timing (OR 1.80, 95% CI: 1.06-3.05) and poor duration (OR 1.92, 95% CI: 1.13-3.27). The Later Heavy Eating (OR 1.95, 95% CI: 1.22-3.09) and the Restricted Window Eating (OR 1.99, 95% CI: 1.04-3.84) had higher odds of poor timing.

Conclusion: These findings highlight the importance of unique chrononutrition patterns in relation to multidimensional sleep health. We provide a framework for future studies to identify personalized chrononutrition interventions and their role in improving sleep health.

Funding Source: This research received no external funding.

Presenter Name/Degree(s): Alison Klevens, BS

Current Position: Graduate Student in Clinical/Bio-Health Psychology

Title: Greater depression severity is associated with later circadian eating time in those with atypical depressive symptoms.

Author(s): Alison M, Klevens[1], Delainey L. Wescott[1,2], Maddison L. Taylor[1], & Kathryn A. Roecklein[1,2]

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Introduction: Circadian misalignment is a transdiagnostic feature of depression and metabolic dysfunction. Timing of food intake can alter peripheral clocks creating internal circadian misalignment. This may be pronounced in the atypical depression subtype, characterized by weight gain, hypersomnia, and fatigue, such as those with seasonal affective disorder (SAD). Atypical symptoms of depression related to appetite and fatigue could enhance circadian misalignment resulting from delayed or prolonged eating window. Greater atypical depression severity may have increased risk for metabolic dysfunction, possibly through pronounced misalignment. The current study tested the effects of depression severity on circadian eating behaviors in SAD. We hypothesized that greater depression severity would predict later circadian eating time and longer eating windows.

Methods: Participants (*N*=90) ages 18-65 years included individuals diagnosed with SAD (*n*=33), Subsyndromal SAD (S-SAD; *n*=16) and non-depressed controls (*n*=41) recruited in winter in Pittsburgh, Pennsylvania. Circadian phase was measured using Dim Light Melatonin Onset (DLMO). Depression severity was assessed using clinician rated semi-structured interviews (Structured Interview Guide for the Hamilton Rating Scale for Depression—Seasonal Affective Disorder Version). Meal timing was captured using daily electronic sleep diaries. Circadian eating time was calculated as the difference between DLMO and the midpoint between the first eating observation and last eating observation. Daily eating windows were calculated as the total duration between an individual's first last meal. Multi-level modeling with a random intercept of participant was used to examine the impact of depression severity on daily measures of circadian eating time and eating window length. Covariates included age, gender, a binary weekday/weeknight variable, and number of diary assessments.

Results: Participants reported mealtimes over 4 to 19 days (*M*=8.88, *SD*=3.62). On average, eating midpoint occurred 7.24 hours before DLMO (*SD*=1.90). Average eating window length was 9.01 hours (*SD*=3.41). Greater depression severity was associated with later circadian eating time (i.e., shorter interval between eating midpoint and DLMO; *b*=-0.03, *SE*=0.01, *p*=0.03). Depression severity was not associated with eating window length (*b*=-0.02, *SE*=0.02, *p*=0.36).

Conclusion: In a sample of individuals with SAD greater depression severity was associated with later circadian eating time, suggesting that people with greater depression are eating closer to their biological night. Longitudinal data are needed to determine if mealtimes, circadian phase, or depression initiate a maladaptive cycle. In contrast to our hypothesis, no relationship was found between depression severity and length of eating window. Length of eating window is independent of timing of eating window, suggesting that timing may be more important than total hours of food consumption in depression.

Funding Source: National Institute of Mental Health (R03MH096119; R01MH103313; KAR).

Presenter Name/Degree(s): Eshika Kohli, BS

Current Position: Sleep T32 trainee

Title: The Formative Development of the Sleep GOALS (Goal-focused Online Access to Lifestyle Support) Intervention for Postpartum Patients

Author(s): Eshika Kohli, BS[1], Daniel J. Buysse, MD[2], Judy C. Chang, MD, MPH[3], Esa M. Davis MD, MPH[4], Megan E. Hamm, PhD[4], Michele D. Levine, PhD[2], Kathleen M. McTigue, MD, MPH, MS[4], Maya Ragavan MD, MPH, MS[5], Marquis S. Hawkins[6]

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Introduction: Postpartum weight management is important in preventing cardiometabolic disease development in birthing people, but standard lifestyle interventions (i.e., diet, physical activity) are only modestly effective.[1-6] [1,7-10] Addressing sleep problems could increase the efficacy of standard interventions for postpartum people because sleep and circadian rhythms influence hunger and metabolism.[8-12] Understanding what postpartum people need to support changes in diet, physical activity, and sleep is important in developing feasible and effective interventions. The study aims to develop a sleep, diet, and physical activity intervention that meets the needs of postpartum people by obtaining their thoughts on the intervention content they would find helpful.

Methods: Our study focuses on behavioral interventions to prevent chronic disease in postpartum people. We conducted 30-60 minute semi-structured interviews with individuals from Allegheny County who recently gave birth (<1 year). Participants completed an importance/difficulty questionnaire to identify which behaviors (sleep, diet, or physical activity) were least/most difficult to change and what content regarding these behaviors would be most important to include in an intervention. We used their responses to craft the interview guide. All interviews were audio-recorded and transcribed for content analysis.

Results: Twenty postpartum individuals were interviewed. The median age of the participants was 33.0 years, and their child's median age was 6.0 months. 14 subjects identified as White, 6 identified as Black, 2 identified as Hispanic, and 1 identified as "other racial identity". Participants reported two key features for a postpartum intervention: strategies to improve sleep and accountability to make/maintain physical activity and diet changes. Many believed that sleep disruptions impacted their ability to manage other aspects of their life, including eating healthily or exercising. A mother with a 6-month-old stated, "I know that lack of sleep can make it harder to lose weight and be physically active. It's easy to say, 'Well, just sleep more,' but if your baby doesn't sleep more, there's not much you can do besides either your spouse gets up or you have a night nurse or something. There are only so many solutions for that problem." In contrast, for diet and exercise, they reported needing support to hold them accountable. A mother with a 5-month-old noted, "I think I'm gonna do this [exercise?] today. It's harder for me to hold myself accountable for it. But, if I do it with someone or know that I'm going to be, discussing it with someone else type-of-thing, then I will make it more of a priority."

Conclusion: While participants described needing support and resources to help with diet and exercise, they expressed lack of knowledge about how they could improve their sleep. Participant feedback was critical in helping us create Sleep GOALS, an internet-assisted intervention. Sleep GOALS supports postpartum people by providing strategies to address sleep disruptions, and monitor sleep, diet, and physical activity behaviors. The intervention provides a lifestyle coach for tailored support, including accountability.

Funding Source: The National Heart Lung Blood Institute 1K01 HL161439-01 and the National Institutes of Health KL2TR001856 funded this study.

Presenter Name/Degree(s): Medha Kotti

Current Position: Medical student, T32 trainee

Title: Day-to-day relationships between alcohol drinking and actigraphic sleep parameters among young adults who report heavy episodic drinking

Author(s): Medha Kotti*, Nicholas Harris MD PhD*, Nina Oryshkewych MS, Daniel Buysse MD, Sarah L Pedersen PhD, Meredith L Wallace PhD, Brant Hasler PhD (*=co-first authors)

Affiliation(s): University of Pittsburgh

Introduction: Alcohol consumption is closely linked to sleep disturbances. Acute alcohol intoxication disrupts sleep stages, continuity, and overall quality depending on age, sex, and severity of dependence. However, the effects of different drinking patterns, particularly binge drinking, on sleep outcomes is complex and incompletely understood. More research is needed objective prospective daily sleep-related measures in young adults engaging in episodic heavy drinking. Here, we explore how increased alcohol consumption is associated with actigraphic sleep at a day-to-day level. We hypothesize that increased alcohol consumption will be associated with poorer same-day sleep outcomes.

Methods: Young adults aged 21-30 years (N=88) engaging in weekly heavy episodic drinking (4+/5+ drinks depending on sex assigned at birth) participated in a two-phase, 9-day ecological momentary assessment (EMA) study, including repeated twice daily prompts alongside participant-driven reporting of daily alcohol consumption. Sleep was objectively measured by wrist-worn actigraphy devices and subjectively by morning sleep diary . Analyzed sleep parameters included total sleep time (TST), sleep efficiency (SE, inverse log-transformed), sleep onset latency (SOL, square root-transformed), and wake after sleep onset (WASO, log-transformed). Linear mixed-effects models assessed day-to-day associations between drinks consumed and each sleep outcome, adjusting for covariates including age, sex assigned at birth, race, ethnicity, and baseline alcohol use. Additionally, secondary analyses explored interactions with body mass index (BMI) to examine its potential moderating effect on alcohol-related sleep outcomes.

Results: Higher alcohol consumption was associated with shorter SOL (ßSTD=-0.11, p=0.0004). No associations emerged between alcohol use and TST (ßSTD=-0.03, p=0.43), SE (ßSTD=-0.02, p=0.53), or WASO (ßSTD=-0.01, p=0.75). Additionally, BMI and sex assigned at birth did not moderate these relationships. Further analyses revealed that race and ethnicity moderated the association between alcohol consumption and SOL, with the relationship being significant among White non-Hispanic participants (ßSTD=-0.11, p=0.001) but not among participants from minority racial or ethnic backgrounds (ßSTD=-0.09, p=0.06).

Conclusion: Increased alcohol consumption was associated with shorter SOL, indicating that participants fell asleep more quickly on drinking nights, without affecting TST, SE, or WASO. While a reduced SOL suggests improved sleep initiation, alcohol sedation dynamics disrupt sleep architecture and impact sleep quality, as well as next-day fatigue. Additionally, race and ethnicity moderated the relationship between alcohol use and SOL, with White non-Hispanic participants showing significant effect though with larger sample size. Future studies will assess sleep fragmentation throughout the night and investigate other influencing factors such as mood, stress, and chronotype. This work aims to better understand the mechanisms underlying the interplay between alcohol consumption and sleep disturbances and their potential implications for the development and maintenance of alcohol-related problems and alcohol use disorder.

Funding Source: T32HL082610, T32MH018951, R01AA026249

Presenter Name/Degree(s): Rachel Lau

Current Position: Undergraduate Student

Title: Associations Between Sedentary Behavior and Physical Activity with Sleep Spectral EEG Parameters

Author(s): Rachel H. Lau, Rachel M. Sanders, Sanjay R. Patel, Daniel J. Buysse, Christopher E. Kline

Affiliation(s): Department of Biological Sciences, Department of Health and Human Development, Department of Medicine, Department of Psychiatry, University of Pittsburgh

Introduction: While physical activity (PA) is well-documented to improve sleep quality, less research has been conducted on the possible association between sedentary behavior (SB) and sleep quality, especially polysomnographic (PSG) markers of sleep quality. The aim of this study was to explore the associations between SB and PA with sleep quality as expressed through spectral analysis of EEG data.

Methods: Data for this cross-sectional study were collected from 93 adults with desk jobs (88.2% White, 58.1% female, age 45.2±11.6 y). An activPAL accelerometer, worn on the upper thigh for seven days, assessed the average time each day spent stepping, standing, in SB, and in prolonged SB (i.e., time spent in SB bouts ≥60 min). An ActiGraph GT3x accelerometer, worn on the waist for seven days, assessed the average time each day spent in moderate-vigorous physical activity (MVPA). A single night of home-based PSG was conducted, using bilateral frontal, central, and occipital derivations. A1 and A2 served as reference electrodes. Spectral analysis of the EEG data was performed from central and frontal channels during N2 and N3 sleep across the whole night. N1 sleep was excluded due to its sparsity and less reliable scoring. Spectral power density was measured across multiple EEG frequency bands, with particular emphasis on delta (0.5-4.0 Hz) and beta (16-32 Hz) frequencies. Natural-logarithm transformations of absolute power in each frequency band were performed prior to analyses. Multiple linear regression models, adjusted for age and sex, were utilized to examine associations between indices of SB and PA and spectral EEG parameters.

Results: Greater time spent in prolonged SB was associated with greater delta power in the central channel (β=0.174, p=0.047), with a weaker nonsignificant association in the frontal channel (β=0.115, p=0.170). Greater time spent standing was associated with a trend toward lower frontal beta power (β=-0.210, p=0.055), though the association was nonsignificant in the central channel (β=-0.079, p=0.470). MVPA was not associated with delta or beta power in central or frontal channels (each P≥0.345). No other significant associations were found between any SB or PA indices and EEG frequency bins.

Conclusion: Our findings suggest that greater time spent in prolonged sedentary behavior may be associated with greater delta power during sleep. Future research is needed to replicate and clarify this finding.

Funding Source: Research supported by NIH grants R01HL134809 (PI: Dr. Bethany B. Gibbs) and R01HL147610 (PI: Dr. Christopher E. Kline)

Presenter Name/Degree(s): Maren McChesney

Current Position: Undergraduate Student, Neuroscience and Psychology Majors

Title: Acute and sustained pupillary responses to light in adolescents with anxiety-related disorders

Author(s): McChesney, M.M.[1]; Wescott, D.L.[2]; Soehner, A.M.[2]; Franzen, P.L.[2]; Clark, D.[2]; Blake, R.[2]; Levenson, J.C.[2]; Buysse, D.J.[2]; Hasler, B.P.[2]

Affiliation(s): *[1]Department of Neuroscience, University of Pittsburgh, Pittsburgh, PA, [2]Department of Psychiatry, University of Pittsburgh, Pittsburgh, PA*

Introduction: Anxiety-related disorders (AD) in adolescents have increased post-COVID-19, underscoring the importance of understanding the physiological underpinnings of these disorders. Retinal sensitivity to light, which is diminished by arousal, may be a novel pathway by which hyperarousal manifests in AD. The current study examined whether retinal light sensitivity is related to AD and/or anxiety symptoms in adolescents.

Methods: Adolescents (ages 13-15) were enrolled in research projects at the Center for Adolescent Reward, Rhythms, and Sleep (CARRS) study. After an overnight visit in the sleep lab, retinal light sensitivity was assessed 30-60 minutes after wake time. Acute and sustained responses to light were assessed using the Pupillary Light Reflex (PLR) and the Post Illumination Pupil Response (PIPR) respectively. AD were assessed using a semi-structured clinical interview (MINI-KID) and anxiety symptoms were captured by the GAD-7. Participants were classified in the AD group if they met sub- or diagnostic threshold for Generalized Anxiety Disorder (GAD), Social Anxiety Disorder, Panic Disorder (PD), Agoraphobia, Separation Anxiety Disorder, Obsessive Compulsive Disorder, or Post-Traumatic Stress Disorder on the MINI-KID. There were 6 participants with AD (GAD=3, PD=1, Separation Anxiety Disorder=1, Social Anxiety Disorder=1) and 42 participants without AD (N=48). We tested whether anxiety was associated with acute and/or sustained responses to light using linear regression models covarying for age and sex at birth.

Results: Participants with AD had significantly lower acute responses to blue light measured by PLR compared to participants without an AD (b=-6.30; SE=2.39; 95%CI: [-11.1,-1.49]; t=-2.63; p=0.011) but not to red light (b=-5.17; SE=3.76; 95%CI: [-12.7,2.39]; t=-1.38; p=0.176). There were no group differences in the PIPR (b=-.009; SE=.023; 95%CI: [-.055,.037]; t=-.394; p=0.695). There was no relationship between anxiety symptoms measured by the GAD-7 and acute (blue light b=.341; SE=.178; 95%CI: [-.699,.017]; t=-1.92; p=0.061 red light (b-.171; SE=.305; 95%CI: [-.784, .443]; t=-.56; p=0.578) or sustained (b =.001; SE=.002; 95%CI: [-.003, .005]; t=.563; p=0.576) pupillary responses to light.

Conclusion: Adolescents with anxiety-related disorders based on the semi-structured clinical interviews were less responsive to blue light stimuli. This finding suggests that anxious adolescents may have reduced sensitivity to blue light, which suggests higher arousal and may be a physiological underpinning of anxiety. These results are limited by the small number of participants with clinically significant anxiety in the current sample. Further research with a larger, more diverse sample would facilitate understanding how pupillary light responses relate to the physiological mechanisms of anxiety-related disorders.

Funding Source: National Institute of Health: NIDA P50DA046346; CARRS Pilot Grant

Presenter Name/Degree(s): Riya Mirchandaney, BA

Current Position: Graduate Student

Title: Morning Misery: Circadian Timing and Negative Affect in a Sample of Adolescents

Author(s): Riya Mirchandaney[1], Daniel J. Buysse[2], Duncan B. Clark[2], Kathryn Guo[2], Greg J. Siegle[2], Brant P. Hasler[2]

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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 all 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 as predictors of morning (PANAS and VAS), evening, and overall NA (PANAS), controlling for age, sex, and socioeconomic status.

Results: Correlations between circadian metrics were low ($r_{DLMO\text{-}MCTQ}$=.20; $r_{DLMO\text{-}CSM}$=.39; $r_{CSM\text{-}MCTQ}$=.27). Greater evening preference predicted higher morning NA (*PANAS:* p=.026, β=-.21; *VAS:* p<0.001, β=-.33) and evening NA (p=.032, β=-.20), but not overall NA (p=.106, β=-.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, β=.18), but not on the PANAS (p=.756, β=-.03); chronotype did not predict evening NA (p=.259, β=-.11) or overall NA (p=.412, β=-.08). Circadian phase did not predict morning NA (*PANAS:* p=.841, β=-.02; *VAS:* p=.552, β=.05), evening NA (p=.625, β=.05), or overall NA (p=.391, β=.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.

Funding Source: R01-AA025626 (Hasler)

Presenter Name/Degree(s): Mrudul Nagapurkar, BS

Current Position: Student Research Assistant

Title: Circadian Variations in Psychomotor Vigilance Performance in Adolescents

Author(s): Peter Franzen, PhD; Adrienne Soehner, PhD; Margaret Kuzemchak; Daniel Buysse, MD; Meredith Wallace, PhD; Ronette Blake, M.S.; Mrudul Nagapurkar, B.S.

Affiliation(s): Center for Adolescent Rewards, Rhythms, and Sleep (CARRS), Department of Psychiatry, University of Pittsburgh

Introduction: Adolescent development represents a crucial transitional phase bridging childhood and adulthood, and is characterized by numerous physiological, psychological, and behavioral fluctuations. While all individuals undergo these shifts, the interplay between genetic and environmental factors profoundly influences the trajectory and outcomes of this period, making it a period of vulnerability for and opportunity to prevent negative outcomes. The specific influences circadian rhythm on adolescent development, particularly in regard to sleep-wake cycles, remain inadequately understood. However, it is expected that in adolescence circadian rhythms become delayed and homeostatic sleep drive decreases. Coupled with environmental factors such as caffeine intake, excessive screen time, and early school start times, this results in insufficient sleep in many adolescents, which may adversely affect adolescent development and lead to several detrimental effects such as increased risk of immune system deficiencies, metabolic disorders, substance use, and more.

Methods: Participants (N=67; mean age = 14.487 (±0.895) years; 49.3% biological female and 50.7% biological male at birth) underwent a two-week home study involving sleep diaries and wrist actigraphy followed by an fMRI scan and 60-hour laboratory period that included a 36-hour ultradian protocol. The ultradian protocol was structured around a "120-minute day", consisting of cycles comprising 80-minutes of wakefulness and 40-minute sleep opportunities over a 36-hour period. During each cycle, participants do a 5-minute psychomotor vigilance task (PVT) to index sustained attention. Statistical analysis methods such as partial and bivariate correlation was used to assess numerous measures of circadian timing, including nadir of core body temperature (CBT) rhythm, dim-light melatonin onset (DLMO), total melatonin, psychomotor vigilance task (PVT) phase, midpoint sleep timing from actigraphy, and other measures such as age at time of lab visit and biological sex at birth.

Results: Several measures of circadian phase were associated in this study. For example, CBT nadir and DLMO ($r=0.389$, $p=0.041$), such that later CBT rhythms were associated with later rise time in melatonin. PVT phase and melatonin were correlated ($r=0.459$, $p=0.016$) such that melatonin increased as circadian timing (indicated by phase) increased. Total melatonin was found to be negatively associated with melatonin onset ($r=-0.542$ and $p<0.001$), and age ($r=-0.428$ and $p=0.009$). Mid-sleep timing from actigraphy was also significantly correlated with CBT nadir ($r=0.487$ and $p=0.004$), indicating that as core body temperature low points increased, mid-sleep timing increased as well.

Conclusion: This study aimed to investigate circadian variations among numerous factors, including psychomotor vigilance performance, core body temperature, and melatonin onset/offset. A deeper understanding is needed to better gauge how circadian rhythms influence adolescent development. Also, further exploration into correlations between circadian timing and measures of PVT performance (such as slowest 10% of reaction times, lapses, etc) is necessary.

Funding Source: External Funding; National Institute on Drug Abuse P50 DA046346, Peter Franzen

Presenter Name/Degree(s): Meera Nair

Current Position: Medical Student

Title: Qualitative Evaluation of Sleep Health in Juvenile-Justice Involved Youth

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Introduction: Youth who are juvenile court system-involved experience structural inequities (including poverty and barriers to care) and systemic racism that contribute to substantial unmet mental health needs, with a disproportionate impact on Brown and Black youth. Previous studies have explored the unmet mental health needs of youth involved in the juvenile justice system. Despite the critical role of sleep to mental health, there is a significant gap in understanding the sleep of this population, with virtually no systematic analysis of sleep health among JJIY.

Methods: The Consolidated Framework for Implementation Research guided the development of a qualitative interview for JJIY and staff working with youth involved in the juvenile justice system. Interviews (n=10 JJIY, n=10 staff) were conducted by trained interviewers and explored the nature of JJIY sleep while living in the community (primarily at home) and residential placement/detention. Coding of each interview relied on inductive and deductive approaches. Independent coding was performed by two coders who reached a consensus via discussion. Coders then conducted a thematic analysis of the findings.

Results: Three key themes emerged within youth interviews: nighttime rumination, diminished autonomy over daily activities, and difficulty sleeping in residential placement related to environmental stimuli. Staff interviews similarly explored themes of environmental stimuli, while additionally delving into JJIY motivation to improve, placement turnover, and continuity of care. These results will be presented as a chart of themes and quotes from youth and staff.

Conclusion: Findings elucidate the need for sleep-focused treatment in the juvenile court system and will inform strategies for translating existing sleep interventions to be relevant to the specific sleep problems reported by JJIY tailored for implementation in juvenile justice settings.

Funding Source: Sponsor ID: HL082610 PI: Jessica Levenson PhD DBSM

Presenter Name/Degree(s): Nicholas Oberlies MD

Current Position: Resident Physician, UPMC Department of Otolaryngology – Head and Neck Surgery

Title: Analysis of Recent Sleep Surgery Fellowship Training

Author(s): Nicholas Oberlies MD[1], Colin Huntley MD[3], Maurits Boon MD[3], Ryan J. Soose MD[1], Rachel Whelan MD[1], Patrick J. Strollo Jr. MD[2,4], Charles W. Atwood Jr. MD[2,4], Mazen El Ali MD[4], Blair Stone MD[4], Julianna Rodin MD[5], Thomas M. Kaffenberger MD[1,2]

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Introduction: Since 2011, Otolaryngologists wishing to become certified in sleep medicine have had to complete a dedicated ACGME accredited sleep medicine fellowship. In addition to standard sleep medicine and sleep surgery fellowships, several institutions have developed hybrid sleep medicine programs that incorporate dedicated time for sleep surgery. We wished to understand the advanced sleep training of surgeons by surveying recent graduates. Our primary aims were to understand the balance between sleep medicine and surgical training requirements and the surgical volume of recent graduates. Our secondary aim was to assess their employment post-graduation.

Methods: Between 2017-2023, we identified twenty-six surgeons who completed a sleep focused fellowship. A survey was developed and emailed to these recent graduates. The survey assessed time spent in sleep medicine and surgery clinics, the type and number of cases graduates completed over the course of their advanced sleep training, and their comfort with these procedures upon completion of their fellowship. Finally, the survey assessed the job prospects of graduates. Data was analyzed with Prism 10.

Results: Nineteen former trainees responded (73%) and 52.6% completed a hybrid fellowship, 21.3% completed a sleep medicine fellowship, and 31.6% completed a sleep surgery fellowship. 94.7% of respondents were Otolaryngologists and 84.8% completed an ACGME accredited Otolaryngology training program prior to fellowship. On average, fellows spent 2.2 days/week in sleep medicine clinic, 1.2 days/week in sleep surgery clinic, and 1.6 days/week in the operating room. The three most common surgeries in fellowship were hypoglossal nerve stimulators, pharyngoplasty, and closed nasal surgeries. Respondents on average received 2.4 job offers, 55% returned to their residency institution, and 89.5% were working at an academic institution.

Conclusion: Our survey demonstrates a wide variability in sleep focused fellowships for surgeons, but the employment market for these trainees is robust.

Funding Source: N/A

Presenter Name/Degree(s): Kaitlyn Petersen, BS

Current Position: Graduate Student

Title: LinCx in the SCN Prevents Jet Lag in Mice

Author(s): Kaitlyn A. Petersen[1], Chelsea Vadnie[1,2], and Colleen A. McClung[1]

Affiliation(s): [1]Department of Psychiatry, Translational Neuroscience Program, Center for Neuroscience, University of Pittsburgh, Pittsburgh, PA, United States, [2]Department of Psychology and Neuroscience, Ohio Wesleyan University, Delaware, OH, United States

Introduction: Circadian rhythms are driven by the principal pacemaker in the brain, the suprachiasmatic nucleus (SCN), located at the base of the hypothalamus. The SCN is largely made up of GABAergic neurons that express vasoactive intestinal peptide (VIP) in the core and arginine vasopressin (AVP) in the shell. To maintain timekeeping, the core and shell signal back and forth to each other via peptide signaling and electrical signaling via gap junctions. However, travel to a new time zone, seasonal changes, or shiftwork can cause the core and shell to become out of sync and result in delayed entrainment, fatigue, and mood changes. In this study, we hypothesized that strengthening the connection between cell types within the SCN would enhance entrainment.

Methods: To enhance SCN connectivity, we utilized a novel technique, Long-term integration of Circuits using connexins (LinCx), in which modified gap junction proteins, which were uniquely designed to strengthen natural connectivity across cell types, are inserted into specific cells of the SCN. VIP/AVP-Cre mice expressing LinCx bilaterally in the SCN were placed into running wheels to monitor daily activity patterns. A light shifting paradigm was then performed to assess entrainment.

Results: We found that, as hypothesized, expression of LinCx in the SCN of VIP/AVP-Cre mice lead to very rapid entrainment to an 8 hr light phase advance and delay. Importantly, when mice were placed in constant darkness (DD) their internal clock remained intact with strong free running rhythms.

Conclusion: This work demonstrates that strengthening the connection between core and shell neurons in the SCN promotes rapid entrainment to light without disrupting the internal clock. This finding has important therapeutic implications for the treatment of jet lag and shiftwork syndrome.

Funding Source: Wood Next Foundation

Presenter Name/Degree(s): Ilaria Prometti

Current Position: PhD Candidate

Title: The Impact of Cannabis Legalization on Sleep

Author(s): Ilaria Prometti[1], Coleman Drake[2], Osea Giuntella[2], Rebecca Costa Bilden[2]

Affiliation(s): 1.University of Pavia, 2. University of Pittsburgh

Introduction: This study investigates the effects of marijuana legalization on sleep patterns in states that have adopted such measures. Both recreational and medical marijuana legalization are contentious topics, and this research aims to provide evidence of their effects on sleep across different population segments, specifically divided by age group.

Methods: Beginning with a descriptive analysis of the data, we employ a staggered difference-in-differences approach to compare states that legalized either medical or recreational marijuana between 2003 and 2022 with those that have not legalized any form of marijuana. In our estimates, we account for state and time fixed effects.

Results: Our findings indicate that the effects vary depending on whether the legalization is for recreational or medical purposes and across different age groups. Notably, while medical marijuana leads to an increase in sleep duration (measured in minutes) for the 50-55 age group (coefficient: 29.22), recreational marijuana generally leads to a significant reduction in sleep duration among the younger age groups (coefficients ranging from -12.27 to -26.37), but a significant increase in sleep among the oldest cohort ages 75-85 (coefficient: 84.32). Furthermore, the reduction in sleep duration among younger age groups is significantly influenced by race-ethnicity, gender, and income levels.

Conclusion: This paper contributes to the literature on the impact of marijuana legalization by specifically examining its effects on individuals' sleep duration. The analysis reveals that the introduction of medical marijuana has a different effect on sleep compared to recreational marijuana.

Funding Source: NA

Presenter Name/Degree(s): Akshaya Raman, BA

Current Position: Medical Student

Title: Evaluation of Pediatric ADHD Medication Management Post-Adenotonsillectomy

Author(s): Akshaya Raman, BA[1]; Elizabeth B. McCarty, MD[2]; Amber D. Shaffer, PhD[2] ; Daniel J. Buysse, MD[1,3]; Rachel L. Whelan, MD[1,2]

Affiliation(s): [1]University of Pittsburgh School of Medicine, Pittsburgh, PA, USA; [2]Department of Otolaryngology, University of Pittsburgh School of Medicine; [3]Department of Psychiatry, University of Pittsburgh School of Medicine

Introduction: ADHD and sleep disorders in children share a bidirectional relationship, where the worsening of one condition can exacerbate the other. Pediatric obstructive sleep apnea (OSA) and ADHD are particularly correlated, sharing an underlying factor of adenotonsillar hypertrophy. Both conditions present with symptoms such as hyperactivity, irritability, and attention deficits. Stimulant medications, including methylphenidate and amphetamine-based formulations, are first-line therapy for treating ADHD in children. However, these medications are not without side effects, including decreased appetite, sleep disturbances, and increased cardiovascular risk. Adenotonsillectomy (AT), the surgical removal of tonsils and adenoids, is the first-line treatment for OSA and has been shown to reduce ADHD symptoms in children, with studies revealing significant improvements in hyperactivity and attention within months post-operation. Longitudinal research supports a reduction in the number of patients continuing to meet ADHD diagnostic criteria after AT. Despite these findings, there is a gap in reassessing ADHD medication regimens, particularly the use of stimulant medications, in children post-AT.

Methods: This ongoing retrospective study includes pediatric patients with ADHD who underwent adenotonsillectomy (AT) at a single academic institution between 2013 and 2024. We excluded patients with Down syndrome, autism, or those diagnosed with ADHD after the surgery. Data were collected on ADHD medications prescribed before and after surgery, including stimulants, non-stimulants (NRIs, alpha-2 adrenergic agonists), antidepressants (SSRIs, NDRIs), and second-generation antipsychotics. Symptom changes were assessed through otolaryngology clinic notes, focusing on the presence of restless sleep, irritability, and short attention span during post-operative follow-up. McNemar's Chi-Square Test was used to evaluate changes in medication class distribution and symptomatology before and after AT.

Results: This preliminary cohort includes 50 patients: 27/50 (54%) male, 40/50 (80%) Caucasian, and 7/50 (14%) African American. Post-adenotonsillectomy, fewer patients experienced 'restless sleep'(OR: 8.00; 95% CI: 1.07-355; p=0.04), while 'irritability' and 'short attention span' did not decrease significantly. The distribution of ADHD medication classes prescribed before and after AT showed no significant change (Stimulants: OR=1.00, 95% CI 0.134-7.47, p=1.0; Non-stimulants: OR=3.00, 95% CI 0.241-157, p=0.6; Antidepressants: OR=2.50, 95% CI 0.09-26.3, p=0.5; Antipsychotics: OR=1.00, 95% CI 0.0127-78.5, p=1.0).

Conclusion: Our preliminary results reveal that the classes of ADHD medications used to treat children did not significantly change after undergoing adenotonsillectomy. While the procedure resulted in a significant reduction of restless sleep, there were no significant decreases in short attention span or irritability, two hallmark symptoms of ADHD. Continuing to collect a larger cohort for analysis, and future prospective study designs are warranted to further explore the relationship between T&A, ADHD symptom changes, and medication adjustments.

Funding Source: NIH T32 Translational Research Training in Sleep and Circadian Science

Presenter Name/Degree(s): Karl Rennick-Zuefle

Current Position: Undergraduate Researcher

Title: Multidimensional Sleep Health in Retired Day Shift Workers and Retired Night Shift Workers

Author(s): Karl Rennick-Zuefle,[1] Kayla Conaty,[2] Joshua Yeoum,[2] Erin McCarty,[3] Daniel J. Buysse,[4] H. Matthew Lehrer[4]

Affiliation(s): [1]Department of Biological Sciences, University of Pittsburgh ,[2]Western Psychiatric Hospital, UPMC, [3]Department of Neuroscience, University of Pittsburgh, [4]Department of Psychiatry, University of Pittsburgh

Introduction: Night shift work is associated with poor sleep quality and the development of sleep disorders, both during work exposure and in retirement. Recognizing the risks of shift work and its impact on sleep is key to forming health recommendations surrounding this growing line of employment. Much of the prior research surrounding sleep and shift work draws from self-reported descriptions of sleep, clinical diagnoses of sleep disorders, or laboratory-based sleep studies (e.g., polysomnography). However, few studies examine habitual sleep patterns from a multidimensional perspective in individuals previously exposed to shift work. This study compared sleep health in retired day workers (RDW) and retired night shift workers (RNSW).

Methods: Participants (N=139, mean age=68.2 +/- 5.3 years, 54.0% females, 15.1% non-White) were 77 RDW and 62 RNSW. Participants provided an average of 6.87 days of sleep diary and actigraphy data, which was collected in participants' home environments. Multidimensional sleep health was quantified using wrist actigraphy measures of sleep efficiency, timing, duration, and regularity, a diary measure of sleep satisfaction, and an Epworth Sleepiness Scale (ESS) score to measure daytime alertness. Each component was dichotomized and summed to create a composite score (0-6); higher values indicated better sleep health. Linear regression models tested associations of shift work exposure group, years of night shift work, and recency of shift work exposure with multidimensional sleep health and its individual components. Models were adjusted for age, sex, race, educational attainment, physical health (RAND-12), and depressive symptoms (CES-D).

Results: Retired night shift workers exhibit marginally worse multidimensional sleep health compared to retired day workers (standardized β=-0.178, p=0.052) as well as poorer diary-assessed sleep quality (standardized β=-0.178, p=0.045). The other individual components of multidimensional sleep health were not associated with shift work exposure group. The duration of night shift work exposure and the recency of shift work exposure were also not associated with multidimensional sleep health.

Conclusion: Compared to former day workers, individuals with a history of night shift work exhibit worse overall sleep health and worse diary-assessed sleep quality in retirement. Importantly, duration of night shift work exposure and time since night shift exposure do not seem to mitigate the effects of night shift work on multidimensional sleep health. These results support a connection between night shift work and poor sleep, which may then lead to worse health outcomes in old age. Given that participants in this study were observed for only one 7-day period, future research could assess changes in sleep health between retired day and night shift workers longitudinally, such as across the transition to retirement. Research into the physiological consequences of night shift work could also establish a causal relationship in this trend and rule out the possibility that individuals with poor sleep health self-select into night shift work.

Funding Source: R01AG047139, Frederick Honors College Research Fellowship 008864

Presenter Name/Degree(s): Madeline R. Scott, PhD

Current Position: Postdoctoral Associate

Title: Cell Type-Specific Circadian Rhythms in the Aging Dorsolateral Prefrontal Cortex

Author(s): Madeline R. Scott[1], Hui Yang[2,5], Tereza Clarence[2,3,5], Donghoon Lee[2,3,4,5], Jaroslav Bendl[2,3,4,5,6], Prashant N.M[2,3,4,5,6], Colleen A. McClung[1], John Fullard[2,3,4,5], Gabriel E. Hoffman[2,3,4,5], Kiran Girdhar[2,3,5,6] , Panos Roussos[2,3,4,5,6,10,11], PsychAD Consortium

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Introduction: The importance of circadian rhythms in health and disease has become increasingly apparent, especially in psychiatry where sleep and circadian behavior disruptions are a common feature across many disorders. Our lab has previously identified differences in gene expression rhythms between sexes, due to age, and in schizophrenia using human postmortem brain tissue. However, these studies were done using bulk tissue RNA-sequencing, which does not measure which cells RNA is from. Notably, the prefrontal cortex is made up of many different cell types, which all play different functional roles, and the role of molecular rhythms within these cells is not well understood.

Methods: In this study, we use a cosinor model to identify circadian rhythms in gene expression from single-nucleus RNA-sequencing of the dorsolateral prefrontal cortex (DLPFC) of 192 subjects with no diagnosed psychiatric illness or neurodegenerative disease. We then compared rhythms between Adult (21 – 60 years; n = 116) and Late Adult (> 61 years; n = 76) subjects within 26 cell type subclasses.

Results: Comparative rhythmicity analyses identified very few genes that were rhythmic in both Adults and Late Adults within each subclass. In Adults, core circadian clock genes were the top rhythmic genes in the majority of neuronal subclasses. However, in Late Adulthood these rhythms are lost. Alternatively, glial cells (Astrocytes, Oligodendrocytes, and Microglia) gained rhythmicity in cellular stress response pathways in Late Adulthood.

Conclusion: This study indicates that aging is associated with cell type-specific transcriptome-wide circadian reprogramming. Our findings are consistent with previous work from bulk RNA-sequencing, which also found that canonical clock genes lost rhythmicity in aging, while a set of previously unidentified transcripts became rhythmic only in older individuals. These findings may represent a compensatory clock that becomes active with the loss of canonical clock function and/or in response to the stressors of aging.

Funding Source: R01AG067025, R01AG082185, R01AG065582; NIH NeuroBioBank at the Mount Sinai Brain Bank (MSSM; supported by NIMH-75N95019C00049), and NIMH-IRP Human Brain Collection Core (HBCC).

Presenter Name/Degree(s): Ryan Soose, MD

Current Position: Director Sleep Division, Associate Professor

Title: The 'USA' System: A Novel Outcomes Classification for Hypoglossal Nerve Stimulation Therapy

Author(s): Ryan Soose MD[1], Elizabeth McCarty MD[1], Linda Magana MD[1], Max Lundeen[2], Anna Bader[2], Israel Byrd[2], Kent Lee[2], Patrick Strollo Jr. MD[3,4], Thomas Kaffenberger MD[1,4]

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Introduction: Hypoglossal nerve stimulation (HGNS) therapy success is traditionally defined by the Sher criteria, which focuses solely on reducing the apnea hypopnea index (AHI) and overlooks usage and symptom response. The proposed *USA* system provides a more comprehensive outcomes assessment of therapy Usage (*U*), Symptom response (*S*), and Apnea burden reduction (*A*).

Methods: The USA system was applied to the ADHERE registry. Adequate *usage* (U) was defined as mean nightly use >4 h/night, *symptom* response (S) by a reduction of ≥2 in the Epworth Sleepiness Scale (ESS) or maintaining a baseline ESS <10 without postoperative increase, and adequate *apnea* reduction as AHI <15 events/hour. USA Class I patients met success criteria in all three categories. Class II was characterized by favorable usage and variations of partial but incomplete response. Class III had inadequate therapy usage.

Results: We analyzed 550 patients from the ADHERE registry. 47.3% of patients met USA Class I criteria characterized by adequate therapy usage, symptom response, and AHI reduction. USA Class II comprised 43.0% and were further categorized as IIA (residual AHI elevation, 21.3%), IIB (residual symptoms, 13.8%), and IIC (residual AHI and symptoms, 7.9%). USA Class III comprised 9.7% of the group.

Conclusion: Almost half of the analyzed HGNS population met success criteria in all three dimensions. However, targeted management and optimization of the other half could substantially impact overall HGNS outcomes. The USA classification system may better capture the variable dimensions of treatment response and guide future research into structured troubleshooting approaches to optimize long-term outcomes.

Funding Source: N/A

Presenter Name/Degree(s): Swathi Srinivasan, MA

Current Position: Doctoral Intern (Kennedy Krieger Institute / Johns Hopkins School of Medicine)

Title: The Impact of Childhood Sleep Disturbances Upon the Development of Anxiety Disorders in Adulthood

Author(s): Swathi Srinivasan, M.A., Carolyn Rabin, PhD, and Matthew Carper, PhD

Affiliation(s): Department of Clinical Psychology, William James College

Introduction: Research has consistently demonstrated a strong link between adequate sleep and psychological, physiological, and cognitive outcomes. The present study was a secondary analysis of a longitudinal dataset and was designed to examine the association of sleep disturbances in childhood with the later development of anxiety disorders. This study also investigated putative predictors (i.e., familial or social support and childhood maltreatment) of both youth sleep problems and anxiety symptom severity in adulthood.

Methods: Participants who provided data to the public release datasets of the Wave I (September 1994 - December 1995) and Wave IV (2008 - 2009) timepoints of the National Longitudinal Study of Adolescent to Adult Health (ADD Health) were included in the study. Summary scores were calculated for key variables such as sleep, anxiety, family support, friend support, and maltreatment by extracting question items of interest informed by previous literature. Multiple regression analyses were used to examine the association of sleep related variables with the later development of anxiety symptoms.

Results: Both Wave I sleep onset ($\beta = 0.07, p < 0.001$) and total sleep time ($\beta = -0.05, p < 0.01$) were associated with Wave IV anxiety, above and beyond the effects of familial or friend support and childhood maltreatment. Individuals who reported taking a longer time to fall asleep during their adolescence then went on to endorse higher symptoms of anxiety in adulthood. Similarly, people who reported shorter sleep durations also endorsed higher anxiety during Wave IV. Childhood maltreatment was predictive of sleep disturbances ($\beta = 0.09, p < 0.001$), specifically sleep onset. Familial support was also associated with sleep onset ($\beta = -0.07, p < 0.001$) and total sleep time ($\beta = 0.07, p < 0.001$). More specifically, adolescents who had a lower family support score also endorsed trouble falling asleep. In contrast, those with higher family support scores endorsed longer sleep durations. However, friend support and maltreatment did not appear to be predictive of total sleep time (both p's > 0.05). Similarly, friend support was also not predictive of sleep onset ($p > 0.05$).

Conclusion: Our results suggest that proper sleep health in adolescence may help mitigate anxiety symptoms in adulthood. This study contributes to the fundamental understanding that poor sleep has consequences that may continue to impact individuals for years. Clinical implications and directions for future research will be discussed.

Funding Source: N/A

Presenter Name/Degree(s): Taylor Ashley Stowe, PhD

Current Position: Postdoctoral Fellow

Title: Circadian Rhythms in Neural Mechanisms Underlying Reward-Related Behaviors

Author(s): TA Stowe, Y Huang, CA McClung

Affiliation(s): University of Pittsburgh

Introduction: Circadian rhythms have a significant impact on psychiatric and substance use disorders (SUDs). There is a bidirectional relationship between circadian rhythms and SUDs as those with disrupted rhythms are more vulnerable to drug-taking and drug-exposure can disrupt circadian rhythms, Notably, drug-taking patterns can vary throughout the day, indicating that individuals may be more susceptible to drug use at certain times of day. Overall, it is crucial to determine the mechanisms that underlie rhythms in reward-related behaviors, like drug-taking, to better understand vulnerability to developing SUDs. The nucleus accumbens (NAc) plays a key role in reward-related behaviors and is primarily made up of GABAergic medium spiny neurons (MSNs) but also contains cholinergic interneurons (CINs). Our lab has previously shown diurnal rhythms in NAc MSN activity with higher activity during the dark cycle; however, MSNs are not all the same with some expressing dopamine D1 or D2 receptors with stimulation differentially impacting reward-related behavior. In addition, we do not know if the CINs have diurnal rhythms in activity.

Methods: We expanded on our previous data by measuring activity via *ex vivo* electrophysiology in the NAc over the 24 hr cycle in specific types of MSNs and CINs. Male and female Drd1-tdtomato mice and ChAT-gfp mice were used to target specific cells in electrophysiology.

Results: Our preliminary data suggest that males have higher activity in MSNs across the light cycle in comparison to females, and that D1 containing cells have higher activity during the dark cycle in comparison to D2 containing neurons. In addition, our preliminary data suggest that CIN activity is higher during the dark cycle, particularly in male mice.

Conclusion: Given the essential role MSNs and CINs play in motivated behaviors, the rhythmic activity in these cells may influence drug-taking behaviors and play a role in vulnerability to developing SUDs. In the future, we aim to investigate whether chronic drug exposure alters these rhythms in MSNs and CINs and if eliminating these rhythms affects drug-taking behaviors. Overall, these novel findings collectively bring us closer to characterizing the role of circadian rhythms in the neural mechanisms that drive reward-related behaviors associated with SUDs.

Funding Source: NIDA R01DA039865 (McClung), NIDA F32DA060613 (Stowe)

Presenter Name/Degree(s): Catherine Tarantine, MD, MSc

Current Position: Pulmonary and Critical Care Fellow, Postdoctoral Scholar

Title: Prevalence of Mental Health Conditions and Traumatic Brain Injury among Veterans with Sleep Disorders

Author(s): Catherine Tarantine, MD[1], Gary Reynolds, MD[2], Kathleen Sarmiento, MD[3], Charles Atwood, MD[1,4]

Affiliation(s): [1]University of Pittsburgh Medical Center. [2]Veterans Benefits Administration. [3]VA San Francisco Health Care System and University of California San Francisco. [4]VA Pittsburgh Health Care System.

Introduction: Sleep disorders and mental health conditions are both very prevalent in the United States. There has been growing work to understand the comorbid nature of these conditions, for example comorbid insomnia and sleep apnea (COMISA). Veterans are more likely to have both mental health conditions and sleep disorders. The comorbid nature of mental health and sleep disorders is very important to ensure adequate treatment of symptoms and appropriate service connection rating within the Veterans Administration (VA). Service connection is granted for a disability resulting from a disease or injury occurring in or aggravated by active service. This study aimed to examine the prevalence of mental health and sleep disorders among veterans.

Methods: Data were obtained from the VA Corporate Data Warehouse for all veterans from 2021 to 2023. Demographic information, sleep disorder diagnoses, service connection status, medical comorbidities, mental health conditions, and traumatic brain injury (TBI) data were collected for all veterans. The resulting prevalences were examined and analyzed.

Results: In 2023, 2,055,538 veterans were identified as having a sleep disorder, which corresponded to 34.61% of the veteran population. The most common diagnoses were sleep-related breathing disorders (74.88%), insomnia disorders (31.84%), and sleep-related movement disorders (5.50%). In 2021-2023, 346,105 veterans (15.92%) with a sleep disorder were service connected. Of veterans with sleep-related breathing disorders, 332,134 (19.91%) were service connected. Of veterans with central disorders of hypersomnolence, 5,315 (18.01%) were service connected. In 2023, 59.17% of patients with a sleep condition had one or more mental health condition (s) compared to 31.30% without a sleep condition. 43.42% of patients with a sleep condition had depression compared to 21.02% without a sleep condition. 32.59% of patients with a sleep condition had post-traumatic stress disorder compared to 14.63% without a sleep condition. 10.38% of patients with a sleep condition had a history of TBI compared to 4.33% of patients without a sleep condition. 3.19% of patients with a sleep condition were service connected for a TBI compared to 1.67% without a sleep condition. Among veterans with a service connection for a sleep disorder(s), 51.02% had a mental health disorder or TBI. In 2023, the following prevalences of other comorbidities were found among veterans with a sleep disorder: diabetes without complications (30.78%), chronic obstructive lung disease (18.52%), diabetes with complications (14.07%), renal disease (11.04%), and cancer (8.56%).

Conclusion: There were high prevalences of mental health disorders and traumatic brain injury among veterans with sleep disorders. Mental health disorders were more prevalent than most medical comorbidities. It suggests that mental health disorders might play a larger impact than medical comorbidities on the lives of veterans with sleep disorders. It could also have significant impact on clinical management as treatment of the underlying sleep disorder might not be sufficient to improve a veteran's sleep-related symptoms. Further work should also examine the impact of combined mental health and sleep disorders on workforce productivity and thus service connection status. This could help ensure veterans receive appropriate compensation for their degree of disability.

Funding Source: The study was funded by VA Office of Connected Care and VA Merit Review. Catherine Tarantine's research is supported by the University of Pittsburgh T32 training grant and ATS ASPIRE fellowship.

Presenter Name/Degree(s): Sarah Teel, B.S.

Current Position: Research Specialist

Title: More Social Support in Adolescents is Associated with Improved Sleep and Reduced Depression Symptoms

Author(s): Sarah A. Teel; Michelle E. Stepan, PhD; Peter L. Franzen, PhD

Affiliation(s): University of Pittsburgh School of Medicine Department of Psychiatry

Introduction: Adolescence marks a life phase of heightened risk of depression and suicidal ideation. Concurrently, major changes in sleep occur, often resulting in worse sleep. Crucially, poor sleep is correlated with a higher risk of developing depression and issues with emotional regulation. Social support has been shown to moderate stress and improve well-being in adolescents. Studies in adults found that social support is linked to longer sleep duration and better well-being. However, few explored relationships between social support, sleep, and mental health in adolescents. The current project aimed to identify the value of social support systems on sleep and depression in adolescents by examining associations between social support, sleep quality, and depression symptoms.

Methods: Participants were 197 adolescents (ages 12-17, 100 females and 97 males) who participated in the Pittsburgh Sleep in Teens Study (SITS) (PI: Franzen), a 4-year longitudinal study assessing relationships between sleep and changes in depression symptoms during adolescence. Here, we analyze relationships between social support, sleep, and depression symptoms in the first two years of data collection in this ongoing study. Sleep was assessed using the Chronic Sleep Reduction Questionnaire (CSRQ), the Cleveland Adolescent Sleepiness Questionnaire (CASQ), and with total sleep time derived from the average of 2-weeks of actigraphy. Self-report questionnaires measured loneliness (UCLA Loneliness Scale; UCLA-LS), social support (Perceived Social Support/Conflict Protocol; PSSCS), and anhedonia (Snaith-Hamilton Pleasure Scale; SHPS). Finally, depression symptoms were assessed using the Center for Epidemiological Studies Depression Scale (CES-D) and anhedonia was assessed using the Snaith-Hamilton Pleasure Scale; SHAPS). Separate correlations for youth in the first year (Y1, N= 197) and the second year (Y2, N= 172) of study participation were examined.

Results: Replicating others, sleepiness and amount of sleep reduction, respectively, were associated with increased depression in both years (Y1: r=.50, p<.001; r=.61, p<.001, Y2: r=.44, p<.001; r=.52, p<.001) and anhedonia only in Year 1 (Y1: r=.26, p<.001; r=.26, p<.001, Y2: r=.08, p=.33; r=.13, p=.11). Depression symptoms were associated with more loneliness (Y1: r=.66, p<.001, Y2: r=.69, p<.001) and social support in both years, including increased conflict within family/friend groups (Y1: r=-.43, p<.001, Y2: r=-.43, p<.001), and reduced social support (Y1: r=.45, p<.001, Y2: r=.43, p<.001). Similar associations were observed between anhedonia and loneliness (Y1: r=.34, p<.001, Y2: r=.30, p<.001) and social support (Y1: r=.44, p<.001, Y2: r=.32, p<.001), though the association with social conflict was weaker (r=-.16, p=.04, r=-.13, p=.13). Furthermore, lower sleepiness and amount of sleep reduction were associated with better social support (Y1: r=.25, p<.001; r=.33, p<.001, Y2: r=.25, p=.003; r=.33, p<.001), less social conflict (Y1: r=-.37, p<.001; r=-.43, p<.001, Y2: r=-.37, p<.001; r=.43, p<.001), and less loneliness (Y1: r=.45, p<.001; r= .58, p<.001, Y2: r=.34, p<.001; r=.47, p<.001) in both years. There were no relationships between actigraphic measures of sleep, mental health, or social support measures (r's<.15, p's>.08).

Conclusion: The relationship between poor sleep and worse mental health was replicated. Social support was highly correlated with self-reported sleep measures and fewer depressive symptoms. Although we cannot determine directionality, one interpretation is that participants with more robust social support networks were able to regulate emotions better and experienced improved mental health and sleep as a result. Future studies should elucidate the mechanism and investigate ways to promote social support and sleep in the prevention or treatment of depression.

Funding Source: National Institute of Mental Health R01MH118312.

Presenter Name/Degree(s): Giana I Teresi, MS

Current Position: Graduate Student

Title: Rest-activity rhythm irregularity is associated with suicide risk in a high-risk adolescent community treatment sample

Author(s): Giana I Teresi[1], Peter Franzen[2], Ola Owoputi[2], Noelle Rode[2], Jamie Zelazny[2], Tina Goldstein[1,2]

Affiliation(s):
1) University of Pittsburgh, Department of Psychology
2) University of Pittsburgh, Department of Psychiatry

Introduction: Sleep and circadian disturbances have been identified as a promising potential and modifiable indicator of near-term suicide risk, with studies demonstrating prospective associations between disturbances and next-day, next-week, and next-month suicidal thoughts and behaviors (STBs) in youth populations. However, no research to date has examined the near-term associations between rest-activity rhythms (RAR), an actigraphy-based measure of circadian rhythm regularity, and STBs in youth. The current project aimed to address this gap by examining the associations between RAR and same-week and next-week STBs in adolescents attending a community intensive outpatient program (IOP) for STBs.

Methods: Participants are 58 adolescents (mean age 17.06; 72.4% female sex at birth) who participated in the Sleep Predicting Outcomes in Teens (SPOT) study. Participants wore an actiwatch (GT9X Link actigraph) for up to 3 months, from which RAR stability metrics—interdaily stability (IS) and intradaily variability (IV)—and daytime activity levels (M10) were computed on weekly intervals. Weekly clinician ratings of depression and suicidal ideation severity were derived from the Adolescent Longitudinal Follow-Up Evaluation (ALIFE) Psychiatric Status Rating (PSR) Scales. Suicidal behaviors were not examined in analyses due to low rate of occurrence. We employed mixed level models to describe the patterns of RARs over time, and to examine concurrent and prospective associations between weekly RARs and suicidal ideation (both the odds of having suicidal ideation with a specific method via logistic regression, and ideation severity via linear regression).

Results: Intra-class coefficient analyses indicated significant within and between-person variability in RARs and daytime activity levels week-to-week (ICCs=0.51–0.66). Lower IS was associated with higher odds of occurrence of suicidal ideation with method (OR=0.61 [95% CI=0.41–0.92], p=.018) and more severe suicidal ideation ratings (β=-0.15, SE=0.05, p=.006) during the same week. Lower IS was also associated with higher odds of next-week suicidal ideation occurrence (OR=0.52 [95% CI=0.29–0.91], p=.023). Moreover, within-person week-to-week decreases in IS (β=-0.13, SE=0.06 p=.019) and M10 (β=-0.11, SE=0.05, p=.031) were associated with more severe suicidal ideation ratings during the latter week. These associations remained significant even after accounting for depression severity and previous-week SI ratings.

Conclusion: Our results indicate greater 24-hour irregularity in RARs may be predictive of near-term suicide risk in adolescents. Considering RARs are modifiable by behavioral interventions, future research may benefit from considering 24-hour circadian metrics, in addition to solely sleep-focused variables, in the study of sleep and suicide risk identification, prevention, and treatment in adolescents.

Funding Source: AFSP (PIs: Goldstein and Franzen; SRG-0-056-16), University of Pittsburgh Clinical and Translational Science Institute (UL1 TR001857), NIH (T32 HL082610; PI: D. Buysse, P. Franzen).

Presenter Name/Degree(s): Mark Thomas, PhD

Current Position: Advanced Postdoctoral Fellow (VA); Visiting Scholar

Title: CBT-I Improves Multidimensional Sleep Health in Veterans with and without Obstructive Sleep Apnea

Author(s): Thomas, M.C.[1,2], Bramoweth, A.D.[1], Seo, Y. [3], Buysse, D.J.[2], and Soreca, I.[1]

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Introduction: Nearly one in five US Veterans have obstructive sleep apnea (OSA), and nearly half of these Veterans have comorbid insomnia with OSA (coined "COMISA"). Recent trials suggest Cognitive Behavior Therapy for Insomnia (CBT-I) effectively treats insomnia in adults with COMISA. However, the effects of CBT-I on multidimensional sleep health – a composite measure of key sleep dimensions linked to health outcomes – are not yet established among patients with insomnia/COMISA. To assess changes in multidimensional sleep health, this study uses electronic medical record data of Veterans who engaged in CBT-I.

Methods: Three sleep health dimensions were extracted from averaged weekly sleep diaries from CBT-I notes (from 10/2015 to 06/2023), dichotomized to reflect optimal levels [efficiency (>85%), duration (6-8 hours), and timing (sleep midpoint 2-4 AM)], then summed to represent total sleep health (0-3). OSA diagnosis was determined by ICD-10 codes. Multilevel models assessed within-person changes from the first to final CBT-I session and compared between Veterans with and without OSA. Covariates included sex, age, race, total sessions attended, and baseline insomnia severity index (ISI) scores.

Results: Among 11,444 Veterans (82.6% Male, mean age = 51.6 years, 38% non-White, 54.5% with OSA), OSA diagnosis was associated with relatively smaller improvement in efficiency ($b = -.06$, $p < .0001$) and total sleep health scores ($b = -.06$, $p = .01$) at the final CBT-I session compared to Veterans without OSA. However, in a subsample of Veterans who completed ≥ 4 CBT-I sessions (n = 6,358), Veterans with OSA had no significant difference for any sleep health measure at the final session from Veterans without OSA.

Conclusion: CBT-I improves sleep health in Veterans with and without OSA, though this benefit was slightly less pronounced in Veterans with OSA. However, completing ≥ 4 CBT-I sessions yielded comparable sleep health improvements regardless of OSA diagnosis.

Funding Source: Goldstein Early Career Mental Health Research Award (Veterans Health Foundation)

Presenter Name/Degree(s): Kate Thurston-Griswold, MSW

Current Position: Behavioral Health Therapist

Title: A Mixed Methods Investigation of Intimate Partner Violence During Sleep Among Survivors

Author(s): Karen Jakubowski, PhD[a]; Kate Thurston-Griswold, BA[a]; Elizabeth Miller, MD, PhD[b]; Rebecca C. Thurston, PhD[a]; Brant P. Hasler, PhD[a]; Maya I. Ragavan, MD, MPH, MS[b]; Judy C. Chang, MD, MS[c]

Affiliation(s): [a]Department of Psychiatry, University of Pittsburgh, Pittsburgh, PA
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Introduction: Intimate partner violence (IPV) research has focused on physical, sexual, and psychological abuse. However, abusive partners may also attempt to restrict, interrupt, monitor, or control women's sleep. We conceptualize "sleep IPV" as a novel type of IPV that involves violent or controlling behaviors that target or impact sleep. We conducted qualitative interviews with women who reported ongoing or past IPV to characterize sleep IPV; we also collected validated self-report questionnaires to better understand sleep among IPV survivors.

Methods: Women completed 1-hour qualitative, semi-structured interviews via Zoom/phone from Feb-Nov 2023. Interviews were audio recorded, transcribed, and coded. Participants self-reported insomnia symptoms (Insomnia Severity Index ≥15), poor sleep quality (Pittsburgh Sleep Quality Index >5), multi-dimensional sleep health (RUSATED; range: 0-12, higher=worse), cognitive/behavioral fears around sleep (Fear of Sleep Inventory, FoSI-1; range: 0-92, higher=worse), and sleep-related traumatic events and nighttime vigilance (FoSI-2).

Results: Participants included 30 women aged 18-62 [*M*(*SD*)=40.2(11.5) years; 70% White, 30% Black; 17% sexual minorities]. To date, 20% of transcripts have been coded. Preliminary themes include: (1) intentional interruptions during sleep (*"He would turn on lights, slam drawers, and stomp around"*); (2) sleep routines dictated by the abusive partner *("I [had] to go to bed when he went to bed"*); (3) abusive partners remotely monitoring women's sleep *("He had hidden cameras in the bedroom"*); (4) physical or sexual abuse during sleep (*"I'd wake up to him touching me"*); (5) vigilance/fear of sleep (*"I never fell asleep before him"*); and (6) adverse impacts of disturbed sleep on mood and health. Considering quantitative results, 67% and 53% of women reported poor sleep quality and moderate/severe insomnia symptoms, respectively, as well as poor sleep health [*M(SD)*=6.9(2.5)] and fears around sleep [*M(SD)*=27.8(22.2)]. Over 55% of women reported traumatic experiences when they were in bed (73%), while they were sleeping (70%), or in the dark (55%); additionally, 62% women reported vigilance at night.

Conclusion: Findings provide initial support for the concept of sleep IPV. Sleep disturbances, sleep-related fears, and vigilance are prevalent among IPV survivors. Results will inform the development of a self-report measure on sleep IPV.

Funding Source: NIH (K23HL159293, UL1TR001857), University of Pittsburgh

Presenter Name/Degree(s): Delainey L. Wescott, MS

Current Position: Clinical Psychology Intern

Title: Sleeping less than usual is associated with greater next day depression and higher reactivity to negative interpersonal events among suicidal adolescents

Author(s): Delainey L. Wescott, MS; Tina R. Goldstein, PhD; Noelle Rode, BS; Beth Hafer, MA; Dawn Rice, MS; Kim Poling, LCSW; David Brent, MD; Peter L. Franzen, PhD

Affiliation(s): Department of Psychiatry, University of Pittsburgh

Introduction: Sleep disturbances are implicated in the risk, maintenance, and treatment of clinical depression. Daily changes in sleep can impact cognitive and emotional functioning and may contribute to depression symptomatology and suicidality. The current study examined daily changes in sleep and next-day depression in a high-risk sample of adolescents and young adults followed longitudinally, and examined whether daily changes in sleep impacted next-day affective reactivity to interpersonal situations.

Methods: Participants (N=198, ages 13-23, 82% White, 76% female sex at birth) were enrolled in an intensive outpatient treatment program for depressed and suicidal youth and young adults (Study 1: 2018-2020; Study 2: 2021-2024). Participants wore an actigraph and completed daily ratings of depression, sleep timing and duration, and positive and negative reactivity to interpersonal events throughout IOP or outpatient treatment (M=60 days, SD=22 days). Weekly depression severity was determined by clinician ratings. Multilevel models were used to test changes in sleep and depression throughout treatment and to examine daily relationships between sleep, next-day depression, and affective reactivity. Age, sex at birth, day in study, clinician rated depression, study protocol, and a binary weekday/weekend variable were included as covariates.

Results: Over the course of treatment, self-reported total sleep time increased (b=0.01; SE=0.01; $p<0.001$) and daily depression severity decreased (b=-0.06; SE=0.02; $p=0.02$), although actigraphy-assessed total sleep time did not change over time (b=0.01; SE=0.01; $p=0.16$). At the daily level, sleeping less than usual was related to worse next day depression based on diary reports (b=-0.29; SE=0.13; $p=0.02$) but not actigraphy (b=-0.19; SE=0.14; $p=0.18$). There was a significant cross-level interaction, such that the effects of short sleep on next day depression were amplified for participants with greater clinician-rated depression severity for both diary (b=-0.22; SE=0.10; $p=0.03$) and actigraphy-assessed sleep (b=-0.32; SE=0.13; $p=0.01$). Further, sleeping less than usual was associated with greater next-day negative affectivity for both diaries (b=-0.32; SE=0.13; $p=0.01$) and actigraphy (b=-0.81; SE=0.19; $p<0.001$). Daily changes in total sleep time were not related to positivity affectivity (diary: b=-0.02; SE=0.13; $p=0.83$ | actigraphy: b=-0.26; SE=0.15; $p=0.14$).

Conclusion: Sleeping less than usual negatively impacted next-day depressive symptom severity, particularly for individuals with moderate-to-severe depression. Short sleep may perpetuate depression through increased negative affectivity to interpersonal events, although mediation models are needed to test causality. Notably, self-reported total sleep time increased throughout an intensive treatment program focused on depression and suicidality. Future work is needed to examine whether increases in total sleep time underlie depressive symptom improvement in this high-risk sample, and/or whether targeted interventions to improve sleep may hasten symptom improvement.

Funding Source: American Foundation for Suicide Prevention, The University of Pittsburgh Clinical and Translational Science Institute (CTSI), NIMH (R01 MH124907)

Presenter Name/Degree(s): Bradley J. Wheeler, BS

Current Position: PhD Student

Title: Multi-Modal Sleep Data and Next-Day Affect: A Machine Learning Comparison of Key Factors

Author(s): Bradley J. Wheeler[1], Daley R. Fraser[1], Rachel Witt[2], Brant P. Hasler[2], Meredith J. Wallace[2]

Affiliation(s): [1]University of Pittsburgh, School of Computing and Information, [2]University of Pittsburgh, Department of Psychiatry

Introduction: Sleep research leverages advanced technologies like ecological momentary assessments and wearable devices generating millions of data points per participant. Machine learning is crucial for analyzing this data, but the choice of algorithm involves trade-offs between complexity, performance, and transparency. Complex algorithms handle high-dimensional data directly and improve performance but require specialized expertise and computing power, while simpler algorithms are more transparent and accessible but need time-consuming preprocessing. This study evaluates the impact of nighttime light, sleep patterns, and wrist actigraphy on next-day affect using three machine learning algorithms—logistic regression, support vector machines, and deep learning—across four data modalities: light and accelerometry from a Phillips Actiwatch, positive affect scores from EMA, and sleep variables derived from accelerometry. By comparing these approaches, we aim to provide insights into which sleep-related factors most influence next-day affect.

Methods: This study draws on data from the Slate, CART, and CARRS studies. The Slate study recruited 150 twelfth graders to explore shared neural signatures of impulsivity and reward reactivity between DSP and substance use disorders. It involved at-home sleep assessments, laboratory visits, and salivary melatonin sampling. The CART study, also involving 150 adolescents, investigated whether circadian disturbances increase alcohol use through reduced impulse control and heightened reward sensitivity, with sleep diary and actigraphy data collected over an eight-day period. The CARRS study, targeting younger adolescents aged 13-15, aimed to identify risk factors for substance use disorders, employing two protocols that included online screening, at-home EMA and actigraphy monitoring, fMRI scans, and melatonin sampling. The outcome for this work is a binary indicator variable to identify whether a participant's average affect for a given day is above or below their average affect for the duration of the time they were in their respective study. The sleep variables encompass the rest start time, rest end time, rest duration, sleep onset latency, snooze time, sleep efficiency, wake after sleep onset, number of wake bouts, scored total sleep time, number of sleep bouts, percent immobile, and fragmentation index. The sleep variables were used with the Actiwatch data to predict affect using the machine learning models identified in the introduction.

Results: Accelerometry data proved to be the most predictive of net day average affect across all the machine learning models evaluated. Red light was also predictive, although this was not universal across all the models. Accuracies across the machine learning models was 0.54, 0.53, and 0.52 for the logistic regression, support vector machine, and deep learning models, respectively.

Conclusion: Results of these experiments indicate that accelerometry and red light data are the most important to consider in evaluating an individuals next day overall affect. Although, it is important to consider that the ability of the models to fit the data was not strong. So, while the models are in agreement, the biases within the models, or the data itself, may not be well suited to model overall next day affect. Future work may consider additional machine learning models or consider other features of the data.

Funding Source: CARRS Pilot Study Grant (PI: Bradley J. Wheeler), R01 AA025626-05 (PI: Brant P. Hasler), RF1 AG056331-04 (PI: Meredith L. Wallace)

Presenter Name/Degree(s): Yuxi Xie, MS

Current Position: Graduate student

Title: Links Between Discrimination and Sleep Quality: The Mediating Role of Negative Affect

Author(s): Yuxi Xie, Brian N. Chin, Brooke C. Feeney

Affiliation(s): Carnegie Mellon University, Trinity College, Carnegie Mellon University

Introduction: Discrimination is a prevalent and concerning issue that poses great risks to the target's physical and mental well-being. Despite emerging evidence linking discrimination to worse sleep quality, there are some gaps in the existing literature: Links between discrimination and sleep health among Asian Americans remain understudied; most of the current studies have been conducted in the United States; also, the underlying mechanisms are underexplored. To address these gaps, this 3-study investigation assessed the associations between discrimination and sleep quality (e.g., sleep duration, difficulties falling asleep/staying asleep) and the mediating role of negative affect using three cross-sectional and cross-cultural datasets. We also assessed the association between stigma consciousness (the extent to which one expects to be stereotyped by and discriminated against by others) and sleep quality, as well as the mediating role of negative affect.

Methods: In three studies, participants completed questionnaires assessing their demographic information (e.g., age, gender, education), discrimination or stigma consciousness experiences, sleep quality, and negative affect. We used multiple linear regression models in R to assess the effects of discrimination on sleep quality. We controlled for demographic and health characteristics in the regression models. Mediation analysis was conducted using the PROCESS macro bootstrapping method (Hayes, 2017).

Results: This research provides consistent evidence for an association between higher levels of discrimination and worse sleep in three different participant samples: a sample of 2609 US adults recruited during the COVID-19 pandemic (β = -.18, p < .001, 95% CI = [-.22, -.13]), a sample of 410 China adults recruited during COVID-19 pandemic (β = -.24, p < .001, 95% CI = [-.32, -.17]), and a sample of 116 Asian/Asian American college students (β = -.91, p = .005, 95% CI = [-1.54, -.28]). Study 3 extended the findings of Studies 1 and 2 by showing that stigma consciousness is also associated with worse sleep outcomes among Asian/Asian American college students (β = -.63, p = .008, 95% CI = [-1.09, -.17]). This research also provides strong evidence in support of negative affect as a mediator linking discrimination to worse sleep outcomes across all three participants samples (Study 1: 95% CI = [-.039, -.018]; Study 2: 95% CI = [-.032, -.002]; Study 3: 95% CI = [-.64, -.13]). Study 3 also showed that negative affect is a mediator linking stigma consciousness to worse sleep quality (95% CI = [-.46, -.06]).

Conclusion: This research expands the existing literature and increases generalizability to wider populations. The results suggest that interventions targeting discrimination are important for improving individuals' sleep quality. The results also suggest that interventions aimed at buffering harmful effects of negative affect stemming from discrimination could promote sleep quality and health.

Funding Source: Graduate Student Small Project Help (GuSH) funds by Carnegie Mellon University

Presenter Name/Degree(s): Joshua Yeoum, B.S.

Current Position: Volunteer Researcher

Title: Comparing Circadian Preference and Self-Reported Sleep Quality in Retired Night Shift Workers and Retired Day Workers

Author(s): Joshua Yeoum[1], Kayla Conaty[1], Erin McCarty[2], Karl Rennick-Zuefle[3], Daniel J. Buysse[4], H. Matthew Lehrer[4]

Affiliation(s): [1]Western Psychiatric Hospital, UPMC; [2]Department of Neuroscience, University of Pittsburgh; [3]Department of Biological Sciences, University of Pittsburgh; [4]Department of Psychiatry, University of Pittsburgh

Introduction: Compared to day workers, night shift workers are more likely to report poor sleep. Night shift work may be associated with a greater preference for eveningness, which has been associated with poorer sleep quality. However, the extent to which circadian preference and poor sleep quality persist into retirement for former night shift workers is not well-known. The purpose of this study was to determine whether prior exposure to night shift work is associated with circadian preference and self-reported sleep quality in retirement.

Methods: Participants (N = 154, 55% females, 86% non-Hispanic White, mean age = 68.44 years [standard deviation = 5.44 years]) were 70 retired night shift workers and 84 retired day workers. Participants self-reported their circadian preference, sleep quality, and daytime sleepiness via the Circadian Type Questionnaire (CTQ), Smith Morningness/Eveningness Scale (Smith), Pittsburgh Sleep Quality Index (PSQI), and Epworth Sleepiness Scale (ESS). Linear regression models were used to compare CTQ subscales (rigidity, vigor, and morningness), Smith, ESS, and PSQI between retired night shift workers and retired day workers. Models were adjusted for sex, age, race, years of education, depressive symptoms (CES-D), and physical health (RAND-12).

Results: Compared to retired day workers, retired night shift workers reported higher PSQI scores ($\beta_{standardized}$ = .238, p = .005), indicating poorer sleep quality. Retired night shift workers also demonstrated a marginally significant preference for evening chronotype based on the CTQ morningness subscale ($\beta_{standardized}$ = -.177, p = .061). No significant group differences were found for scores on CTQ rigidity and vigor, Smith, and ESS.

Conclusion: Retired night shift workers demonstrated significantly poorer sleep quality compared to retired day workers, as indicated by higher PSQI scores. Despite being retired, night shift workers showed a marginal trend towards eveningness, which is consistent with the sleep patterns of current shift workers: working during the night and sleeping during the day. Future research should further investigate whether this relationship – retired shift workers tending toward an evening chronotype – is causal, exploring whether individuals with an evening chronotype are more likely to choose shift work or if individuals develop this chronotype to adapt to shift work.

Funding Source: R01AG047139

Presenter Name/Degree(s): Afsara Zaheed, PhD

Current Position: Postdoctoral Scholar/T32 Fellow

Title: Trajectories of sleep amount, regularity and timing across three cognitive-aging pathways in community dwelling older adults

Author(s): Afsara B Zaheed, Amanda L Tapia, Nina Oryshkewych, Bradley J Wheeler, Meryl A Butters, Daniel J Buysse, Yue Leng, Lisa L Barnes, Andrew Lim, Lan Yu, Adriane M. Soehner, Meredith L Wallace

Affiliation(s): Department of Psychiatry, University of Pittsburgh

Introduction: Comparing sleep and rest-activity rhythms across neurodegenerative versus healthy cognitive aging pathways can yield novel mechanistic insights; however, our current understanding is limited by differences in sleep measurement, limited longitudinal data, and heterogeneous cognitive aging processes.

Methods: We applied cubic splines to longitudinal self-reported sleep and actigraphy data from 1559 participants in the Rush Memory and Aging Project, and quantified differences in the levels and trajectories of sleep amount, regularity, and timing within and between three cognitive aging pathways (Normal, Normal-MCI, Normal-Dementia).

Results: Sleep amount was lowest in the Normal-Dementia pathway prior to cognitive impairment but increased with age, most rapidly following dementia. Regularity declined most rapidly within Normal-MCI and Normal-Dementia pathways. Timing advances accelerated following dementia.

Conclusion: Shorter sleep amount in cognitively healthy older adults may be a risk factor or prodromal indicator of dementia, while longer amounts, earlier timing and irregularity may reflect more advanced neurodegeneration.

Funding Source: R01 AG056331 (PI: Wallace); R01 AG17917 (PI: Bennett); T32 HL082610 (MPD: Buysse)