0160

WAKE PROMOTION BY SUPRAMAMMILLARY NITRIC OXIDE NEURONS CRITICALLY DEPENDS ON GLUTAMATE RELEASE

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Introduction: The caudal hypothalamus contains a key node of the ascending arousal system, with lesions causing more profound somnolence than can be accounted for by involvement of nearby hypothalamic orexin and histamine cell groups.
Methods: We used chemogenetic manipulations and Cre-lox glutamate release disruption in anatomically- and genetically-targeted neuronal groups of the caudal hypothalamus and recorded EEG and EMG, with subsequent histological analysis of injection sites and terminal fields of transduced neurons. ANOVA was used for statistical analysis of sleep physiology and non-parametric statistical mapping was used to objectively determine the region that was wake-promoting in the caudal hypothalamus.
Results: Activation of glutamatergic supramammillary (SuM_{vglut2}) neurons or a subset of them that also express nitric oxide synthase (Nos1, $SuMV_{glut2/Nos1}$) is potently wake-promoting. Genetic disruption of glutamatergic neurotransmission from SuM_{vglut2} neurons nearly completely abolishes the effects of SuM activation. Targeted chemogenetic inhibition of SuM_{vglut2} neurons produced fragmented wakefulness and increased sleep, akin to drowsiness following caudal hypothalamic injury.
Conclusion: $SuM_{vglut2/Nos1}$ neurons exert potent control over behavioral wakefulness, with these effects depending critically on glutamate release. Glutamate neurons of the SuM, including a key subset that contain nitric oxide, likely represent the long-sought caudal hypothalamic component of the ascending arousal system.
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0161

ACTIVE AND PASSIVE BEDTIME SOCIAL TECHNOLOGY USE RELATED TO DAYTIME SLEEPINESS AND SLEEP

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Introduction: Social technology use today is virtually ubiquitous among younger cohorts resulting in students frequently sleeping with their smartphone in the bedroom, on the bedside table, on the bed, or under the pillow. We examined the relationship of active and passive social technology use with daytime sleepiness and sleep. Active social technology use was defined as initiating social technology use during bed time, whereas passive social technology use was defined as the potential for social technology sleep interruption in the absence of user action.
Methods: 258 university students (M=19.9 years old, SD=4.89) were recruited from introductory psychology courses and given extra credit for participation. Each participant completed the SHI with an additional question assessing active social technology use during bedtime: I check e-mail, texts, or social media during my sleep time (between going to bed and waking up), and a question addressing passive social technology use during sleep time: I sleep with my phone sounds or vibrations turned on where I could hear it if I were awake. Scores on the active and passive technology use questions were analyzed separately, and were combined to create a single combined bedtime technology use score. Participants also completed the Epworth Sleepiness Scale (ESS), the Pittsburg Sleep Quality Index (PSQI), additional questions regarding associated features of inadequate sleep hygiene, and demographic information.
Results: 60.5% and 70% of students reported frequently or always using active or passive bedtime social technology, respectively. More frequent combined bedtime social technology use was significantly related to greater daytime sleepiness (ESS) ($r(251)=.284$, $p<.05$), higher global PSQI scores ($r(237)=.201$, $p<.05$), and higher scores on the associated features of inadequate sleep hygiene including daytime sleepiness ($r(255)=.279$, $p<.05$), preoccupation with sleep ($r(253)=.237$, $p<.05$), mood disturbance ($r(253)=.230$, $p<.05$), avolition ($r(255)=.281$, $p<.05$), and reduced cognition ($r(255)=.291$, $p<.05$)).
Conclusion: Students were found to be frequent users of bedtime social technology. Active and passive bedtime social technology use was found to be related to poorer sleep quality, greater sleepiness, and increased features associated with inadequate sleep hygiene. Future research should investigate whether bed partner active and passive social technology use disrupts sleep.
Support (If Any): none.

0162

PILOT STUDY EXAMINING THE EFFECTS OF AIRCRAFT NOISE ON SLEEP IN COMMUNITIES NEAR PHILADELPHIA INTERNATIONAL AIRPORT

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Introduction: Aircraft noise can disturb sleep and impair recuperation. Field studies need to be conducted to develop exposure-response models that are representative of noise exposed communities around multiple airports to inform policy. A methodology of monitoring sleep and identifying awakenings based on ECG and actigraphy has been developed. This approach is non-invasive and study participants can use the equipment unattended which greatly reduces the methodological cost compared to polysomnography. To evaluate its feasibility, this methodology was implemented in a pilot field study conducted in the vicinity of Philadelphia International Airport.
Methods: Eighty participants were enrolled in the study; 39 exposed to nighttime aircraft noise (41% male, 22–77 years) and 40 from a control region (48% male, 22–68 years) completed measurements. Baseline sleep and health characteristics were obtained subjectively on the first day. The participants then completed three consecutive nights of unattended ECG and actigraphy measurements with concurrent sound recordings in their bedroom. Blood pressure and brief questionnaires subjectively assessing their sleep were additionally completed each morning.
Results: Linear mixed models were calculated, controlling for age, gender, and BMI, to examine differences between the two groups of participants. Individuals living near the airport reported poorer sleep quality on the PSQI ($p=0.0180$) and worse health on the SF-36 ($p=0.0074$) surveys. No statistically significant differences were found for the morning sleep assessments, diastolic ($p=0.7108$) and systolic ($p=0.3255$) blood pressure, or sleep fragmentation index ($p=0.6986$) (calculated based on the ECG and actigraphy data). A random effect logistic regression was calculated to examine whether the indoor noise level of single aircraft events related to objective measurements of awakenings. The coefficient for noise level was positive and statistically significant ($p=0.0094$).
Conclusion: This study demonstrates the feasibility of unattended physiological and noise measurements. The conflicting results between single event and cumulative sleep assessments require further investigation.

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0163

AMPLITUDE OF LIGHT EXPOSURE IS ASSOCIATED WITH MATERNAL HOSTILE ATTRIBUTIONS AND CHILD BEHAVIORAL PROBLEMS.

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Introduction: Light has potent effects on entraining circadian rhythms, including sleep and daily variations in cognitive performance. Additionally, light acutely influences cognition (e.g., alertness, cognitive flexibility) and mood-states. However, little work has examined associations between light and higher-order social cognition. In parent-child dyads, social cognitive factors have been linked to maladaptive parenting and poor child outcomes. If light exposure influences child behavior and social cognitive factors linked to parenting, light may have potential as a novel intervention for improving family functioning. The present study examines whether amplitude of light exposure is associated with maternal hostile attributions and child behavior in disadvantaged mother-child dyads.
Methods: Pilot study of 22 low-income mother-child dyads (mean ages mother = 29.08, child = 4.46 years). Light data were collected via wrist-worn photic sensors for 7 consecutive days. Circadian parameters were calculated with cosinor in R. Maternal hostile attributions and punishment were assessed with Child Vingettes and child behavior was assessed by the Child Behavioral Checklist.
Results: In children, lower light amplitude was significantly associated with parent- and teacher-reported withdrawn behaviors ($r = -.47$, $p = 0.02$ and $r = -.51$, $p = 0.03$, respectively) and showed trend-level associations with more anxious/depressed and aggressive behaviors. Higher light amplitude in mothers was associated with increased reports of children's anxious, depressed and emotionally reactive behaviors. Maternal light amplitude was associated with hostile attributions ($r = -.32$, $p = 0.08$) and punishment ($r = -.29$, $p = .10$) at trend levels, suggesting mothers may have overly negative perceptions of their children's behavior.
Conclusion: Findings suggest lower light amplitude in children is linked to more withdrawn and anxious/depressed behaviors. Lower maternal light amplitude was associated with increased maternal ratings of problem behavior in their child and tended to be associated with increased maternal hostile attributions and punishment. These findings suggest that light exposure may impact parent-child relationships by directly affecting specific aspects of parental social cognition as well as child behaviors. Consequently, light may have potential as a novel intervention to improve mother-child interactions.
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0164

EFFECT OF A DAYLIGHT LED VERSUS A CONVENTIONAL LED SOLUTION ON VISUAL COMFORT, DAYTIME ALERTNESS AND SLEEP

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Introduction: Conventional LED light sources have a discontinuous light spectrum with a prominent "blue" peak between 450-480nm, which potentially impacts on human circadian physiology and sleep. Thus, we investigated the effects of an advanced LED source simulating the natural daylight spectrum on visual comfort, daytime alertness and sleep.
Methods: Twelve male young good sleepers spent twice 2.5-days in the laboratory once under a conventional (convLED) and once under a daylight simulating LED (dayLED) condition (16 hours LED exposure during scheduled wakefulness) in a balanced cross over design flanked by a 8-h baseline and a post-light exposure night. The same light settings were used for convLED and dayLED (100 photopic lux at the eye level with a color temperature of 4000K). However, the light spectrum and the color rendering index differed considerably between convLED and dayLED. Subjective visual comfort and sleepiness were continuously rated on conventional scales, and the PSGs were quantified for sleep stages and EEG spectral power density during nonREM sleep.
Results: The volunteers rated the light quality of the dayLED as being more pleasant than the convLED ($p=0.07$). They also felt significantly more alert during the dayLED condition compared to convLED ($p<0.01$), particularly in the morning/midday hours between 9 and 13h. In comparison to the baseline night, convLED significantly decreased the proportion of NREMS (-4.4 %, $p<0.03$) at the cost of REM sleep (+5.2%, $p<0.004$) and reduced EEG power density in the lower spindle frequency range between 11.5- 13.5 Hz ($p<0.04$), while such changes in sleep were not presented for dayLED.
Conclusion: We have preliminary evidence that a daylight LED lighting solution has beneficial effects on visual comfort and daytime alertness and does not affect all-night sleep EEG activity when compared to a conventional LED solution.
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0165

REPORTED LIGHT IN THE SLEEP ENVIRONMENT: VALIDITY OF A SLEEP DIARY

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Introduction: Light is the primary cue for the circadian system, and even relatively dim light can exert effects on the biological clock. Thus, measures of light exposure in the sleeping environment are critical for evaluating sleep health. While sleep diaries are an inexpensive, albeit subjective, alternative to actigraphy devices, they typically do not include light information. The addition of several questions addressing perception of light in the sleep environment may provide a crude yet affordable metric of relative photic intensity and photoreceptor stimulation in the sleeping environment.
Methods: 7–14 days of concurrent actigraphy and sleep diary data were collected from Emergency Room nurses and corpsmen (N=12, 133 nights). Four questions regarding perception of light, whether it was natural or artificial, and whether objects and color were visible in both the bedtime and waking environment were added to the Consensus Sleep Diary, Morning administration (CSD-M). Utilizing linear mixed models, responses were evaluated against actigraphy-derived sleep and photosensor measures from the beginning and end of each rest interval (± 2h).
Results: In our predominantly day-working sample (start time 0600), affirmative answers to all questions regarding the waking environment were associated with higher Total Sleep Time (all p <0.01), and perception of natural light was associated with greater Wake After Sleep Onset (p <0.05). Additionally, reported natural light and color in the waking environment were both associated with a greater number of minutes above 100 lux (both p <0.05). No associations with questions regarding the bedtime lighting environment were found.