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TOO JITTERY TO SLEEP? TEMPORAL ASSOCIATIONS OF ACTIGRAPHIC SLEEP AND CAFFEINE IN ADOLESCENTS

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Introduction: The majority of adolescents report consuming a caffeinated beverage on a typical day, which has been linked to poor sleep health in cross-sectional studies. However, it is unknown whether poor sleep predicts caffeine consumption, and/or whether caffeine consumption predicts poor sleep, particularly when sleep is measured objectively. The current study examined within- and between-person associations of actigraphic sleep dimensions with caffeinated beverage consumption in adolescents.

Methods: Data were collected from a micro-longitudinal substudy of the age 15 wave of the Fragile Families and Child Wellbeing Study (n=589). Adolescents wore a wrist-actigraphy device and completed daily surveys for approximately one week (mean=5.6 days). Daily surveys assessed sleep quality and caffeinated beverage consumption (0=no caffeine, 1=any caffeine). Separate mixed models assessed whether actigraphy-measured sleep duration, timing, maintenance efficiency, and subjective quality predicted next-day caffeinated beverage consumption within and between adolescents. Variability of sleep duration and timing (SD), sleep regularity index, and social jetlag were tested as additional between-person predictors. Lagged models tested whether daily caffeinated beverage consumption predicted sleep that night (n=458; mean=5.2 days).

Results: Between-person results showed that adolescents who had more variable actigraphic sleep duration (OR=1.21, p=.042) and sleep midpoint (OR=1.27, p=.045) had greater odds of consuming caffeinated beverages compared to others. Within-person results showed that on days when adolescents consumed ≥1 caffeinated beverage, they had later sleep onset by (b±SEM) 17±6 mins (p=.003) that night and later wake time by 19±7 mins (p= .011) the next morning, compared to days when they did not consume caffeine. Sleep duration, timing, maintenance efficiency, and subjective quality did not predict next-day caffeinated beverage consumption (all p>.10).

Conclusion: Greater variability in sleep duration and timing and later sleep timing are risk factors for poor emotional and cardiometabolic health. Curbing caffeinated beverage consumption may aid in the maintenance of regular sleep schedules and advance sleep timing in adolescents, potentially improving physical and psychological health.

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N2 SLEEP SPINDLE ACTIVITY IS ASSOCIATED WITH BETTER NEXT-DAY EMOTION REGULATION IN HEALTHY CHILDREN

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Introduction: Children's day-to-day mental health is dependent on adequate quantity and quality of sleep, but far less is known about the microstructural sleep features that support emotional functioning in children. NREM sleep spindles (rhythmic EEG oscillations between 10 and 15 Hz) are closely linked with intellectual abilities and cognitive processing, and have also been shown to relate to children's emotional behavior, both concurrently and longitudinally. For example, socially-anxious youth showed reduction in sleep spindle activity compared to healthy controls, which correlated negatively with subjective reports of arousal in response to negative images (Wilhelm et al., 2017). In younger children, greater NREM 2 spindle density was associated with greater prosocial behavior concurrently and fewer behavioral and social problems one year later (Mikoteit et al., 2012; 2013). However, studies in pediatric samples are limited overall and haven't examined spindles in relation to objective measures of emotion regulation.

Methods: We examined relationships between spindle activity during NREM stage 2 (N2) and next-day subjective and objective emotional responses among N=26 healthy children, 7-11 years old. Children completed a full-night of at-home PSG monitoring (10hr sleep opportunity) followed by two in-lab tasks. In task 1, children rated arousal/reactivity in response to negative images from the International Affective Pictures System (IAPS). In task 2, respiratory sinus arrhythmia (RSA) was measured while children were directed to suppress all facial expressions of emotion (i.e., regulate emotional responses to negative content) while watching negatively-valenced movie clips. All analyses controlled for total sleep time on PSG night and RSA analyses controlled for a resting baseline period.

Results: Greater C3 spindle count (r = .51, p < .05) and density (r = .53, p < .05) were significantly associated with less child-reported arousal towards negative images. Greater F3 peak spindle frequency was positively associated with higher RSA during negative movies (r = .54, p < .05), suggesting better regulatory control of emotional responses to correspond with greater spindle peak frequency.

Conclusion: Together with previous data, our findings suggest that sleep spindle activity may partially reflect children's capacity to regulate emotional responses in relation to stressful situations, thereby potentially reducing risk of mental health problems.

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POST-BIRTH FEEDING EXPERIENCES ARE ASSOCIATED WITH ACTIGRAPHY-ASSESSED SLEEP PATTERNS AMONG NEWBORNS

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Introduction: Exclusively breastfed (EBF) newborns wake more often at night than partially breastfed, or exclusively formula fed (EFF) newborns. Contextual factors during the first weeks of life related to these associations are understudied. We examined relationships among post-birth experiences, objectively-estimated sleep-wake patterns, and feeding practices through three weeks post-delivery.

Methods: English or Spanish speaking mothers (n=20) and their full-term (≥37wk), singleton infants were recruited from Phoenix, Arizona. Mothers were 32.7±5.1y, 30.0% identified as Hispanic, 20.0% with < high school degree, and 15.0% were enrolled in the federal Women, Infants, and Children program. Infants were born normal weight (2500-4000g) and without major complications. At three weeks post-delivery, infants wore a Micro Motionlogger (Ambulatory Monitoring Inc.) on their left ankle for five 24hr periods at three weeks of age. Mothers completed an accompanying

sleep diary and an adapted Infant Feeding Practices Study-II questionnaire. Pearson correlations and t-tests examined relationships between nocturnal sleep-wake patterns and feeding practices at birth and 3-weeks post-delivery.

Results: At birth, all mothers attempted breastfeeding, 40.0% of infants received formula, and mean time for milk to come in was 2.7 days (range: 1-4). At three weeks, one mother was EFF, 55.5% (n=11) were EBF, and 40.0% (n=8) were mixed feeding. Infant sleep-wake patterns included midpoint of 2:40±1:01, long wake episode (≥5min) frequency of 5.8±2.3, longest sleep bout duration of 127.2±34.9min, WASO of 124.1±54.3min, and TST of 434.7±79.7min. Breastmilk feeding frequency was positively related to long wake episode frequency (r=.49, p=0.03) and WASO (r=.47, p=0.04), and negatively related to longest sleep bout (r=-.59, p=0.006). Formula feeding frequency was positively related to longest sleep bout (r=.58, p=0.007). Greater time for milk to come in was positively related to long wake episode frequency (r=.53, p=0.02) and WASO (r=.56, p=0.01), and negatively related to longest sleep bout (r=-.47, p=0.04). Receiving formula in the hospital was associated with later sleep midpoint (t[18]=3.2, p=0.005), regardless of current formula feeding.

Conclusion: Feeding experiences and ability to breastfeed during the first few days of life may play a role in the quality and patterning of actigraphy-estimated sleep among newborns. Future research should investigate whether these associations persist into later infancy.

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BRAIN CONNECTIVITY AND PARENTING: ASSOCIATION BETWEEN FAMILIAL FACTORS AND SLEEP EEG COHERENCE IN INFANCY

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Introduction: Brain connectivity is tied to cognitive development and behavior. Previous work suggests that interactions with the environment tune the maturing patterns of brain connectivity. As the relevant environmental factors remain largely unknown, we examined whether the sleep-related familial context is associated with infant brain functional connectivity measured through sleep EEG coherence.

Methods: At-home 124-channel sleep EEG was recorded in 31 healthy infants aged 5.5 to 7.4 months (mean age=5.9±0.5mo; 15 females). Coherence was calculated for the first 80 20-second epochs of NREM sleep in delta (0.75–4.25Hz) and sigma (9.75–14.75Hz) bands, frequencies undergoing pronounced maturational dynamics. We averaged coherence within three regions over the frontal lobe (left, central, right) identified as regions with the strongest connectivity through data-driven clustering. For these regions and bands, linear regression models quantified the association between coherence and familial context, i.e., scores from the Brief Infant Sleep Questionnaire (i.e., sleeping arrangement and bedtime routine), Baby Care Questionnaire (i.e., Structure and Attunement subscales reflecting parental principles regarding infant sleep regularity), Maternal Cognitions about Infant's Sleep

(i.e., total score), age and sex. The best-fitting model was selected through backward selection (Akaike information criterion).

Results: Surprisingly, sex was the most consistent contributor across regions and bands, with girls exhibiting greater coherence than boys (FDR-corrected 0.004≤p≤0.038). Furthermore, older infants showed lower sigma coherence over the right frontal lobe (FDR-corrected 0.002≤p≤0.004). Additionally, infants co-sleeping with parents or siblings demonstrated lower delta and sigma coherence over the right frontal lobe than infants sleeping in their own bed (FDR-corrected 0.001<p≤0.025). Similarly, fewer maternal worries regarding the infant's sleep were associated with lower sigma coherence in the right frontal region (FDR-corrected p=0.014). Finally, more regular bedtime routines were linked to increased delta coherence over the left frontal lobe (FDR-corrected p=0.014).

Conclusion: Based on previous observations indicating that in healthy children the right hemisphere develops first with a subsequent shift in asymmetry to the left, we propose that environmental factors such as co-sleeping, fewer parental worries, and more structured sleeping routines in infancy may serve as targets for early interventions to support this process and thereby healthy brain development.

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ASSOCIATIONS BETWEEN PRESCHOOLERS' BEHAVIORAL DIFFICULTIES AND VARIABILITY IN SLEEP DURATION AND BEDTIME

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Introduction: Variability in children's sleep patterns has been linked with health outcomes including obesity, poor mood, and behavioral difficulties. However, much of this evidence stems from parent-reported measures of sleep. Understanding these associations in preschool-age children using device-based measures is important as sleep habits tend to develop and stabilize during this time. The purpose of this study was to examine associations between parent-reported behavioral difficulties and device-measured sleep among preschoolers.

Methods: Ninety-five preschool-aged children (3-5 years, 51% female, 30% Black) with at least two valid nights of sleep were included in this analysis. Children were asked to wear an Axivity AX3 accelerometer on their non-dominant wrist for 30 days. Parents completed the Strengths and Difficulties Questionnaire which assessed child behaviors over the past 6 months. Raw accelerometry data were processed with GGIR (v2.3). We used MixWild to conduct mixed effects location scale models with a random intercept and scale predicting nocturnal duration variability and bedtime variability. Time invariant behavior subscales (conduct problems, hyperactivity/inattention, peer relationship problems, emotional symptoms, prosocial behavior, and total difficulties) were included as predictors of child sleep duration and bedtime variability.

Results: Children had an average of 13.4 ± 7.4 (range 2-29) nights of valid data. Average nocturnal sleep duration was 9.7 ± 1.4 hours and average bedtime was 9:48 PM. There were no statistically significant associations between any SDQ subscales and variability in children's sleep duration and bedtime. There was an association between random location and scale such that