

engagement (ii) likert-rated school stress; and (iii) cognitive function (PROMIS t-scores). The model covaried for gender, race-ethnicity, and school-level

Results: Our model fit well (RMSEA=.041). Examining total effects (direct + indirect), online and hybrid instruction were associated with lower SLS (b 's: -.06 to -.26; p 's<.01). The three online groups had the strongest effects (synchronous: b = -.15; 95%CI: [-.20, -.11]; asynchronous: b = -.17; [-.23, -.11]; mixed: b = -.14; [-.19, -.098]; p 's<.001). Sleep disturbance was also negatively associated with SLS (b = -.02; [-.02, -.02], p <.001). Monte-carlo simulations confirmed sleep disturbance mediated online instruction's influence on SLS. The strongest effect was found for asynchronous instruction, with sleep disturbance mediating 24% of its effect (b = -.042; [-0.065, -.019]; p <.001). This sleep-mediated influence of asynchronous instruction propagated down to each SLS measure (p 's<.001), including a near 3-point difference on PROMIS cognitive scores (b = -2.86; [-3.73, -2.00]).

Conclusion: These analyses from the NESTED study indicate that sleep disruption may be one mechanism through which online instruction impacted learning during the pandemic. Sleep disturbances were unexpectedly influential for unscheduled instruction (i.e., asynchronous). Future analyses will examine specific sleep parameters (e.g., timing) and whether sleep's influence differs in teens who self-report learning/behavior problems (e.g., ADHD). These nationwide data further underscore the importance of considering sleep as educators and policy makers determine school schedules.

Support (if any):

238

ADOLESCENT SLEEP VARIABILITY, SOCIAL JETLAG, AND MENTAL HEALTH DURING COVID-19: FINDINGS FROM A LARGE NATIONWIDE STUDY

Patricia Wong,¹ Amy Wolfson,² Sarah Honaker,³ Judith Owens,⁴ Kyla Wahlstrom,⁵ Jared Saletin,⁶ Azizi Seixas,⁷ Lisa Meltzer,⁸ Mary Carskadon¹

¹E.P. Bradley Hospital Sleep Research Laboratory, ²Loyola University Maryland, ³Indiana University School of Medicine, ⁴Boston Children's Hospital, ⁵University of Minnesota, ⁶Alpert Medical School of Brown University; E.P. Bradley Hospital, ⁷NYU Grossman School of Medicine, ⁸National Jewish Health

Introduction: Adolescents are vulnerable to short, insufficient sleep stemming from a combined preference for late bedtimes and early school start times, and also circadian disruptions from frequent shifts in sleep schedules (i.e., social jetlag). These sleep disruptions are associated with poor mental health. The COVID-19 pandemic has impacted education nationwide, including changes in instructional formats and school schedules. With data from the Nationwide Education and Sleep in TEens During COVID (NESTED) study, we examined whether sleep variability and social jetlag (SJL) during the pandemic associate with mental health.

Methods: Analyses included online survey data from 4767 students (grades 6-12, 46% female, 36% non-White, 87% high school). For each weekday, participants identified if they attended school in person (IP), online-scheduled synchronous classes (O/S), online-no scheduled classes (asynchronous, O/A), or no school. Students reported bedtimes (BT) and wake times (WT) for each instructional format and for week-ends/no school days. Sleep opportunity (SlpOpp) was calculated from BT and WT. Weekday night-to-night SlpOpp variability was calculated with mean square successive differences. SJL was calculated as the difference between the average sleep midpoint on free days (O/A, no school, weekends) versus scheduled days (IP, O/S). Participants also completed the PROMIS Pediatric Anxiety and Depressive Symptoms

Short Form. Data were analyzed with hierarchical linear regressions controlling for average SlpOpp, gender, and school-level (middle vs high school).

Results: Mean reported symptoms of anxiety (60.0 ± 9.1 ; 14% ≥ 70) and depression (63.4 ± 10.2 ; 22% ≥ 70) fell in the at-risk range. Shorter average SlpOpp (mean = 8.3 ± 1.2 hrs) was correlated with higher anxiety ($r = -.10$) and depression ($r = -.11$; p 's<.001) T-scores. Greater SlpOpp variability was associated with higher anxiety ($B = .71$ [95%CI = 41-1.01, p <.001) and depression ($B = .67$ [.33-1.00], p <.001) T-scores. Greater SJL (mean = 1.8 ± 1.2 hrs; 94% showed a delay in midpoint) was associated with higher anxiety ($B = .36$ [.12-.60], p <.001) and depression ($B = .77$ [.50-1.03], p <.001) T-scores.

Conclusion: In the context of system-wide education changes during COVID-19, students on average reported at-risk levels of anxiety and depression symptoms which were associated with greater variability in sleep opportunity across school days and greater social jetlag. Our findings suggest educators and policymakers should consider these sleep-mental health associations when developing instructional formats and school schedules during and post-pandemic.

Support (if any): T32MH019927(P.W.)

239

CHANGES IN CHILDREN'S SCHOOLYEAR AND SUMMER SLEEP DURING THE COVID-19 PANDEMIC

Sarah Burkart,¹ Hannah Parker,¹ Lauren Von Klingraeff,¹ Ethan Hunt,¹ Alexis Jones,¹ Roddrick Dugger,¹ Layton Reesor-Oyer,¹ Michael Beets,¹ R. Glenn Weaver,¹ Bridget Armstrong¹

¹University of South Carolina

Introduction: In spring 2020, elementary schools closed to minimize the spread of COVID-19. Questionnaire data suggest children's sleep was impacted during the pandemic, yet device-based data (i.e. accelerometry) on this topic is lacking. The purpose of this study was to examine children's sleep during the COVID-19 pandemic (i.e. spring and summer 2020) compared to previous data collected from the same children during each of the two previous years (spring and summer 2018 and 2019).

Methods: 68 children (age = 9.9 ± 1.2 years, 56% Black, 53% male) previously recruited for an observational cohort study wore a Fitbit Charge 2 on their wrist during the spring and summer from 2018-2020 (i.e. six 30-day measurement periods). We used multilevel mixed models to examine how children's sleep patterns changed during the pandemic accounting for previous trajectory (i.e. 2018 to 2019). Models included age, sex, and race as covariates.

Results: Children had an average of 84 nights of sleep data across all six 30-day measurement periods. In the spring of the pandemic, children slept 24.6 minutes more (95%CI = 11.6, 37.5) compared to previous springs. During the pandemic summer, they slept 40.0 minutes more (95%CI = 24.6, 58.5) compared to previous summers. Sleep midpoint was 117.1 minutes later (95%CI = 103.6, 130.6) in the spring during the pandemic and 46.0 minutes later (95% CI = 26.9, 65.2) in the summer during the pandemic compared to previous years. Sleep efficiency improved slightly by 1.3% (95% CI = 0.7, 1.9) and 3.6% (95% CI = 2.7, 4.5) in spring and summer, respectively, during the pandemic compared to previous years.

Conclusion: During the COVID-19 pandemic, children slept longer after accounting for previous developmental trends. Notably, the shift in sleep timing during the pandemic was nearly two hours later in the spring compared to previous years, potentially due to the lack of structure usually provided by school. Later sleep timing is independently associated with poor health behaviors (e.g., nutrition, physical activity, screen time). Future studies should examine if these changes in sleep

persist over time and have potential long-term effects on children's health.

Support (if any): R21HD095164 (PI Weaver) & UofSC COVID-19 Research Initiative Grant (PI Armstrong)

240

HABITUAL SLEEP CHANGES FOLLOWING COVID-19 OUTBREAK

Shuli Eyal,¹ Yuval Altman,¹ Anda Baharav¹

¹Hypnocore

Introduction: The ongoing COVID-19 pandemic emerges as one of the most impressive and strenuous events of the century, with unthinkable huge global effects. We aimed at analyzing if and how does the pandemic affect sleep and related behaviors.

Methods: We reviewed 48,047 nights recorded in the US with the SleepRate application by 3,381 users during a period of 2 years, December 2018–November 2020. Nightly data included perceived and measured sleep parameters. In addition, users reported their perceived daytime stress and sleepiness. We analyzed the monthly variability of the studied parameters and compared their values during the COVID-19 period of March–November 2020 (CP) with those in the previous corresponding period in 2019, the pre-COVID-19 period (PCP).

Results: Starting March 2020, wake-up time (WUT) was significantly delayed relative to PCP. WUT in April 2020 was the latest (8:06AM±2:12hours, mean±SD, $p<.000$), being an hour later than in April 2019. This delay started to diminish in June 2020, reaching 7:27AM±2:10 hours by November 2020, which was not significantly higher than during PCP. Bedtime (BT) exhibited similar behavior, yet it returned to PCP times faster. Delayed BT and WUT on weekends were observed during CP as well as PCP. No consistent differences in sleep duration or sleep efficiency were detected between CP and PCP. Subjective sleep satisfaction was higher in CP relative to PCP. However, daytime sleepiness and daytime stress were also higher during most of CP compared to PCP.

Conclusion: Our data, based on digital in-app sleep diaries coupled with perceived sleep parameters, demonstrate the pandemic's effects on sleep behavior in the US. Users in this study adapted to the new circumstances with delayed sleep schedule, while not reducing the sleep opportunity. The higher sleep satisfaction may be connected to later sleep schedules, allowing a wake-up time that fits better human biological clocks. The reported increased stress and sleepiness further portray the uncertainty and turbulence characterizing the pandemic's effects on populations life during the pandemic. As good sleep is linked with immune response efficacy, higher quality of life, and improved mood, the importance of sleep must not be overlooked, especially during the pandemic.

Support (if any):

241

REMOTELY DELIVERED YOGA NIDRA FOR INSOMNIA AND ANXIETY DURING COVID-19

Erica Sharpe,¹ Matthew Butler,² Doug Hanes,¹ Ryan Bradley¹

¹National University of Natural Medicine, ²Oregon Health and Science University

Introduction: Insomnia and related anxiety affect 30 - 50% of the US adult population. These conditions often coexist, and contribute to increased mortality from depression, heart disease, and stroke. The current COVID-19 pandemic has heightened anxiety and sleeplessness, and 53% of US adults report the pandemic has affected their mental health. There is a need for research into therapies for anxiety

and insomnia that can be delivered remotely for increased accessibility to reach more individuals in need.

Methods: To contribute to this need, we examined the effects of remotely delivered Yoga Nidra (translated to mean “yogic sleep”), a guided meditation practice, on anxiety and sleep. The practice was delivered in real-time before bed, or asynchronously via an online REDCap-based platform, once per week for 16-weeks from April to July (during the early months of the COVID-19 pandemic).

Results: Seventy-four individuals joined the study, of whom 71% reported subthreshold insomnia (Insomnia Severity Index score of 14 ± 4), and 74% reported anxiety (Generalized Anxiety Disorder Index score of 10 ± 5). Seventy-one (96%) participants accessed the asynchronous recordings. Remote delivery of this practice proved very feasible, with no adverse events reported, and although we provided no monetary compensation, 50% of our sample still completed a post-intervention survey. Further, 52% of $n=25$ respondents who completed both pre- and post-intervention sleep surveys reported decreased sleep onset latency (SOL) the following day, with a mean decrease of 10 minutes (95% CI = $-19.0, -0.5$) for all respondents, and strongest change (-34 min; $p=.017$) measured for those who reported SOL between 30-120 min at baseline. Overall state anxiety was decreased by 41% for $n=32$ respondents who completed pre-post State Trait Anxiety Index (STAI) surveys surrounding a single practice (average score of 47 ± 11 before practice vs. 27 ± 8 after practice, $p<.0001$).

Conclusion: Remotely delivered Yoga Nidra is feasible to deliver, and demonstrates potential benefits for anxiety and insomnia, warranting additional research.

Support (if any): This work was supported by the R90 BRIDG grant at the Helfgott Research Institute at the National University of Natural Medicine.

242

SUFFICIENT SLEEP ATTENUATES THE IMPACT OF COVID-19 PANDEMIC ON EXECUTIVE FUNCTION DECLINE IN LATE ADOLESCENTS AND YOUNG ADULTS

Xiaopeng Ji,¹ Jennifer Saylor¹

¹University of Delaware School of Nursing

Introduction: Executive function (EF), which shows continued development into early adulthood, is essential to build resilience to cope with COVID-19-related social and environmental changes. However, how sleep interacts with the pandemic on affecting EF remains unclear, particularly among late adolescents and young adults. This study examined (1) the impact of COVID-19 pandemic on sleep and EF and (2) whether sleep moderated pandemic-related changes in EF among young people aged 18-21 years old.

Methods: Between April and May 2020, university students with baseline data on sleep and EF (Spring and Fall semesters in 2019) available were invited to this follow-up study. Sleep duration, mid-sleep times, social jetlag (the difference between mid-sleep times on weekdays and weekends) and sleep latency were assessed using 7-day sleep diaries. Participants also completed the Pittsburgh Sleep Quality Index (PSQI), the Morningness/Eveningness Questionnaire, and the Behavior Rating Inventory of Executive function which yielded Global Executive Composite (GEC) scores. Paired t-test and multilevel random-effects models (STATA 16.0) estimated the associations. Covariates in multilevel models included age, sex, race, family income, parental education, COVID status, and health behaviors.

Results: Forty participants (19.25 ± 1.12 years old) had paired data before and during COVID-19 pandemic. Participants slept 24 min longer ($t=-2.07, p=0.03$) but had increased sleep latency ($t=-1.83, p=0.07$) during the pandemic compared to pre-COVID baseline. Mid-sleep