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and text message reminders.

Materials and Methods: Healthy adolescents (12-18 yrs old) with schoolday sleep duration <7 hours and without other sleep disorders such as insomnia and delay sleep phase disorder were randomly allocated to intervention or non-active control group. The intervention consists of four weekly, group-based therapy delivered using motivational interviewing approach and 3 week daily text reminders. Assessments were conducted at baseline, post-intervention, 3-month and 6-month follow up. The primary outcomes were sleep-wake pattern captured by 7-day sleep diary. The intervention effect was evaluated by linear mixed model. The trial was registered with the Clinical Trial Registry (NCT03614572).

Results: A total of 212 adolescents (mean age: 15.8±0.98; female:60.1%) were recruited from Aug 2018 to Apr 2021. Approximately 80% of the adolescents attended all the follow up assessments. Adolescents in the intervention group have significantly earlier schoolday bedtime at post-intervention (intervention vs. control: -14 mins vs +19 mins) and 6-month follow up (-14 mins vs + 21 mins) compared to the control group (F=4.6, P=0.004). They also had a tendency of increased sleep duration throughout the follow up period, but the difference was not significant (F=2.22, P=0.089). This is explained by the difference in schoolday wakeup time as control group had a significant later wakeup time at post-intervention (intervention vs. control: -2 mins vs +23 mins) in relative to the intervention group. It is not common to observe a change in schoolday wakeup time as wakeup time is largely determined by early school schedule. The outbreak of Coronavirus in 2020 has forced schools to close and adopted an online study mode. The online class schedule varied significantly between schools, which might explain the difference in wakeup time at follow up assessment. Despite there is no significant difference in schoolday sleep duration, adolescents in the intervention group reported greater intention to behavioral changes (P=0.043), and lower level of daytime sleepiness (P=0.001). However, there is no difference observed in sleep knowledge, mood symptoms and quality of life.

Conclusions: This study supports that motivational interviewing in combined with text reminders are effective approach in advancing adolescent bedtime, improving their motivation and daytime functioning. Adolescents were able to maintain earlier bedtime regardless of the school schedule. We suggest that advancing bedtime protocol should be incorporated at school-level to benefit more adolescents.

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AMERICAN LIFE IN REALTIME (ALIR): PERSON-GENERATED HEALTH DATA FROM FITBIT TO ASSESS THE MULTI-LEVEL INFLUENCE OF SOCIAL DETERMINANTS ON SLEEP AND OTHER HEALTH OUTCOMES IN VULNERABLE AND UNDERSERVED POPULATIONS

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Introduction: Social and structural determinants of health—including economic/educational inequalities, healthcare access, systemic racism, and lifetime stress—account for 60-80% of modifiable risk factors that contribute to sleep health disparities. Many sleep interventions use population averages to create “one-size-fits-all” approaches, but are limited by individual heterogeneity in number, magnitude, interplay, and amplification of social determinants. Person-generated health data (PGHD) derived from consumer digital technologies (including wrist-worn monitors, such as Fitbits) are invaluable and rapidly emerging tools for “precision public health,” a field that aims to develop personalized digital interventions targeting unique needs of specific populations. PGHD can continuously measure everyday lived experiences and health in a continuous manner outside of intermittent clinical settings and are increasingly being used to assess sleep health. However, PGHD are typically captured from convenience samples through “bring-your-own-device” designs, and thus, have systematically underrepresented high-risk groups, including Black or American Indian/Alaska Native individuals, and low-income populations. To address this significant gap, the American Life in Realtime (ALIR) was developed to provide the first-in-kind holistic and sociodemographically representative registry of continuously-collected Fitbit and health data. The current study provides preliminary data on the ALIR sample, study methods, recruitment, and multi-level social, behavioral, and environmental correlates of sleep health.

Materials and Methods: Participants were recruited from existing members of a nationally-representative survey panel of American adults from USC’s Understanding America Study, with oversampling of racial/ethnic minorities and low-socioeconomic status individuals. Individual-level longitudinal data include: (1) raw sensor PGHD from provided Fitbits worn continuously by participants for at least 1 year (transformed through machine learning into “features” including sleep duration and efficiency); (2) sociodemographics and geolocation, collected every 3 months; (3) all elements from the Health and Retirement Survey, collected annually; (4) social determinants (e.g., food security, adverse childhood events) from validated scales collected annually; (5) validated health scales (e.g., depression, anxiety, disability) collected monthly; and, (6) contextual data from public data sets (e.g., air quality, crime, ambient noise).

Results: To date, 1007 individuals consented to participate between August 3rd and November 23rd, 2021. Racial/ethnic distributions include 65% White, 13% Black, 4% American Indian/Alaska Native, 9% Asian, 1% Hawaiian/Pacific Islander, 8% Mixed, and 26% Hispanic/Latino, with relatively even gender and age distributions. Seventy percent of individuals are without a bachelor’s degree, and 20% have at least one chronic condition (e.g., obesity, cardiovascular disease). Overall response rates exceed 87%, averaging 90% for surveys and 82% for Fitbits. Planned analyses will also examine the association between social, environmental, and behavioral factors with sleep duration and efficiency.

Conclusions: ALIR establishes a generalizable research infrastructure to use PGHD to explore the influence of population-specific lived-experiences on sleep and other health outcomes in virtually any population. This novel and ongoing research infrastructure which will ultimately be publicly available, providing an invaluable resource to better understand and intervene on sleep health disparities.

ANALYSIS OF SLEEP AND SEDENTARY LIFESTYLE HABITS AMONG ITALIAN WOMEN DURING COVID-19 PANDEMIC: A PILOT STUDY

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Introduction: COVID-19 pandemic has drastically reduced physical activity levels. Sedentary behaviors are strictly associated with higher risks of developing diseases, including cardiovascular diseases, obesity, type II diabetes, some specific cancers, cognitive alterations, neurodegenerative diseases, etc. (Allen et al., 2017). Severe lockdown periods and personal quarantine had influenced the quality and quantity of sleep, eating behaviors, the physical activity levels, inducing increased stress and anxiety among the population. Our study aimed to analyze lifestyle habits in a group of 14 volunteer women aged from 40 to 50 years with the scope of analyzing specific lifestyle and anthropometric changes induced by COVID-19 pandemic.

Materials and Methods: Semi-Structured questionnaires on lifestyle habits, anthropometric measures, sleep were administered with Google forms. Data were collected three times: before, during, and after lockdown. Data are reported as mean ± standard deviation (S.D.). Before using parametric tests, the normality assumption was verified using the Shapiro-Wilk W test. Variables association was assessed using Pearson’s product-moment correlation coefficients (i.e., r). An analysis of variance (ANOVA) for repeated measures with the Newman-Keuls test was used to compare the physiological parameters among the different recording sessions. Comparisons between PSQI variable means were performed using the Student’s paired t-test.

Results: During the lockdown, the daily number of steps shows a reduction of -65%. The number of weekly walking kilometers was drastically reduced by -70%. No statistically significant improvements were registered in the Pittsburgh Sleep Quality Index (PSQI), although the number of steps had returned to pre-COVID levels. The PSQI global score seems to normalize after lockdown, but the data are not statistically significant. We
observed an inverse correlation between daily dissipated kilocalories and latency of falling asleep in the lockdown phase (r = −0.56; p = 0.04). The correlation is not maintained in the post lockdown phase, suggesting that other stressogenic factors influence the latency of falling asleep (r = 0.53; p = 0.06). The PREDIMED questionnaire revealed a sufficient adherence to the Mediterranean diet (mean score 7.5). The mean quantity of daily sleep hours during the lockdown was 6.64 ± 0.74 versus 6.89 ± 0.56 of the post lockdown phase. Anthropometric parameters like waist circumferences were found to significantly increase between pre-COVID-19 and post lockdown phases (waist circumference pre versus post lockdown observation 80.4 ± 8.5 cm versus 83.4 ± 9.9 cm (p = 0.013). The waist/Hip ratio increased after lockdown (p = 0.033). No significant changes were observed in body mass index (p = 0.487). However, an increasing trend was observed for weight.

Conclusions: The study highlights that educational strategies are necessary to avoid the risks of prolonged sedentary behaviors in women. COVID-19 pandemic has dramatically reduced daily steps and caloric dissipation by movements, leading to an increased waist circumference, associated with visceral fat accumulation, silent inflammation, and increased risk of cardiovascular disease. Correct sleep hygiene, promoting adequate and monitored physical activity levels, and increased adherence to the Mediterranean diet are achievable goals advocating adult women’s health.

Acknowledgments: We acknowledge the volunteers who kindly participated in the study.

ASSOCIATION BETWEEN SCHOOL START TIME AFFEC TED BY EXTRACURRICULAR ACTIVITIES AND SLEEP DURATION: NATIONAL QUESTIONARY SURVEY IN JAPAN

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Introduction: Long extracurricular activities are observed in adolescents, but their associations with sleep habits and daytime sleepiness are unclear. This study aimed to evaluate how basic age and gender, extracurricular activity time, and lifestyle habits are associated with school start time, sleep duration, and daytime sleepiness.

Materials and Methods: An online survey was conducted throughout Japan from October 7 to December 31, in 2020. The questionnairenaires were distributed by parents to their children through Parent-Teacher Association first to the third year of junior high school. Grade (1 to 3), gender (male, female, unspecified), Pediatric Daytime Sleepiness Scale (PDSS), sleep duration on weekdays, basic lifestyle (TV/mobile phone use, morning sunlight, caffeine use, nighttime brightness), and prefecture of residence were collected. From the residence, the average weekly extracurricular activity time was calculated and used for analysis (>900, 800-900, and <800 min/week). Regression and multiple regression analyses were performed with sleep duration and PDSS as outcomes, using R.

Results: There were 3419 participants in the study (1774 males, 1580 females, 65 unspecified). Those who started school before 7:30 and after 9:00 had longer extracurricular activities (p < 0.001). Regression analysis of gender, grade, school start time, extracurricular activity time, and lifestyle on sleep duration in weekdays showed that school start time before 7:30 a.m. was associated with a decrease in weekday sleep time (β = −0.096, p < 0.001) even after adjusting for lifestyle factors. Extracurricular activity time was not associated with weekday sleep duration, but the analysis of covariance structure showed that long extracurricular activities affected weekday sleep time through school start time. Regression analysis of school start time and these variables on PDSS showed that long extracurricular activity time was associated with daytime sleepiness (β = −0.035, p = 0.05), even in the model after adjusting for weekday sleep duration.

Conclusions: It might be necessary to set a school start time that is not too early and to prevent extracurricular activities from being too long to take appropriate sleep duration in adolescence.

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ASSOCIATION OF SLEEP MICROSTRUCTURE WITH INCIDENT HYPERTENSION IN A POPULATION-BASED SAMPLE: THE HYPNOLAUS STUDY

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Introduction: Although evidence suggests that altered sleep quality is associated with increased incident hypertension (HTN), few studies have investigated the impact of objective parameters of sleep structure on HTN. This study aimed to determine the association between sleep macro- and microstructure and incident HTN in a middle-to-older aged sample of the general population.

Materials and Methods: Participants from the HypnoLaus population-based cohort without HTN at baseline and with HTN status at 5-year follow-up were included. All participants had an at-home polysomnography at baseline allowing to assess sleep macrostructure (N1, N2, N3 and REM sleep stages) and microstructure (power spectral density of electroencephalogram [EEG] in non-REM sleep and spindles characteristics [density, duration, frequency, amplitude] in N2). Associations between incident HTN and sleep macro- and microstructure were assessed with multiple-adjusted logistic regression including adjustment for age, sex, and body mass index, alcohol consumption, systolic blood pressure, diabetes, dyslipidemia, obstructive sleep apnea, and sleep efficiency.

Results: A total of 1172 participants (42% men, 55±10 years) without HTN at baseline were included. Of them, 198 (17%) developed HTN over a mean follow-up of 5.2 years. Although the percentage of N3 was lower in the incident HTN group in bivariate analysis, no sleep macrostructure features were associated with incident HTN after multiple adjustments. Low absolute delta and sigma power were significantly associated with incident HTN; participants in the lowest quartile of delta and sigma had a 1.7-fold increased risk of incident HTN than those in the highest quartile. Moreover, higher spindle density (adjusted odds ratio [ORa]: 0.87, 95% confidence intervals: 0.76-0.99) and spindle amplitude (ORa: 0.98 [0.95-1.00]) were associated with a lower incidence of HTN.

Conclusions: Sleep microstructure but not macrostructure is associated with the development of HTN. Slow-wave activity and sleep spindles, two hallmarks of objective sleep continuity and sleep quality, were inversely associated with incident HTN after multiple adjustments. This reinforces the protective role of sleep continuity in the development of HTN and further cardiovascular diseases.

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ASSOCIATIONS BETWEEN SLEEP-RELATED CHARACTERISTICS AND NEGATIVE PERSONALITY TRAITS: A SYSTEMATIC REVIEW AND META-ANALYSIS

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Introduction: Adequate sleep is essential for physical and mental health. Given the high prevalence of sleep disturbances and their significant

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