Educational intervention course to improve sleep and well-being in students at Francisco Bravo Medical Magnet High School

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Background

Teenage students, especially those in competitive academics, are at risk for sleep deprivation.[1] This can harm health, mood, and academics.[2] The current recommendation from the National Sleep Foundation is 8-10 hours of sleep per night for adolescents.[3] Further, adolescents' melatonin, the "sleep hormone," often does not release until late at night and peaks in the very early morning.[4] This causes them to be more awake later in the day and more tired when they need to get up for school. The shift in circadian rhythm makes it difficult for teens to adapt their sleep schedule to a "normal" day and get the recommended 8-10 hours of sleep per night. The biological change in sleep, coupled with academic pressure to get homework done, often influences students to stay up later. The net effect is that students are sleepy at school.[1] Weekend "catch up sleep" is problematic, too, as it gets adolescents out of their circadian rhythm.[5]

In addition to considering the biological and schedule factors that impact adolescent sleep, it is also important to consider the impact of bed time autonomy, caffeine, physical activity, friends, homework, electronics, noise, and responsibilities at home. Researchers in the field of adolescent sleep have highlighted the importance of sleep education and encouragement to make healthy sleep choices,[6,7] especially with regards to electronics usage that cause sleep difficulties. Additionally, electronics usage has been linked to depressive symptoms.[8]

The sleep deficit in this population is significant enough that the United States government initiative, Healthy People 2020, includes "increase the proportion of students in grades 9 through 12 who get sufficient sleep" as one of its 4 sleep health objectives. This is because they report that in 2009, only 30.9% of students in these grades got sufficient sleep.[9] As screen time has suddenly increased, while the duration of other distracting behaviors has remained relatively stable, the percentage of adolescents sleeping 7 hours a night or less has also increased, suggesting the impact of electronics usage on sleep behaviors.[10,11]

Sleep problems from adolescence have been found to persist into adulthood,[12] highlighting the need for early intervention in sleep education. Lack of sleep had been identified by students as a problem at Francisco Bravo Medical Magnet High School by other after school program leaders. As such, a course was created to educate students about sleep behavior and physiology. We hypothesized that after an educational sleep intervention, subjects would report increased sleep time per night, decreased depression,[13] and improved knowledge regarding sleep behavior and physiology.

Hypothesis

We hypothesized that after an educational sleep intervention, subjects would report increased sleep time per night, decreased depression, and improved knowledge regarding sleep.

Methods

A curriculum was created to teach high school freshmen about sleep, including its physiology, importance, and impacts on health, as well as methods to improve sleep hygiene and habits. Subjects were recruited by an assistant principal through health class. They underwent a 4-hour after-school course taught by the principal investigator, which included a 9-week sleep behavior change project and journal. Pre- and post-course surveys measured sleep hours, bed times, and knowledge about sleep. The surveys also measured depression using the PHQ-9, a validated instrument. Of the 24 subjects recruited, 18 (1 boy, 17 girls) completed all parts of the course and thus were included in statistical analysis. T-tests and χ^2 tests were used to analyze pre- to post-test change.

Results

Behavior change

- Subjects reported an increase in average sleep hours per school night (pre-intervention 6.9 hours to post-intervention 7.8 hours, p=0.0134, with 50% of students reporting an increase in average hours slept per night). (Figure 1)
- Subjects reported an increase in average weekend night bed time (11:36pm to 10:54pm, p=0.0307, with 44% of students reporting an earlier average bedtime). (Figure 2)

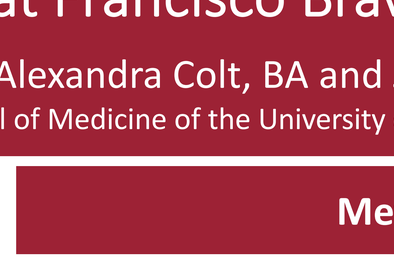

Figure 1. Average school night hours slept

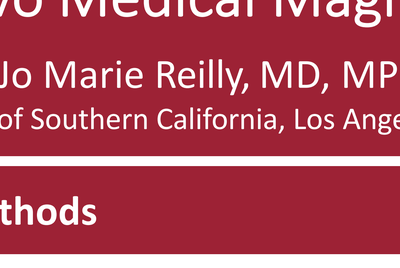

Figure 2. Average school night bedtime

- Subjects reported improvements in mood, tiredness, and energy, and less caffeine use. They reported increased use of consistent bed time, a key teaching point, as a sleep aid.
- The most common goal for change after this course was no electronics usage before bed, followed by no caffeine before bed, sleeping more, and having the same bed time every night (including weekends).

Knowledge gained

- There was a decrease in the understanding of the number of hours teenagers should sleep (8-10 hours per night), as the number of students who answered the multiple-choice question correctly decreased (13 subjects to 7, p=0.0442).

Depression levels

- PHQ-9 depression scores trended downward, as did the number of subjects with moderate or more severe depression.

Discussion

Subjects were interested in learning about and improving their sleep. The education course plus the sleep habit change project and journal resulted in statistically significant improvements in average sleep hours and average weekend night bed times, suggesting understanding of the needs for more sleep and for consistent bed times. However, there was a decrease in understanding of the number of hours teenagers should sleep (8-10 hours per night), which may indicate the need to further emphasize the adequate number sleep hours needed in adolescence. Subjects identified the sleep behavior change journals as an important factor in their ability to improve their sleep habits, suggesting that sleep knowledge is most likely not enough to achieve behavior change, rather, an interactive task was instrumental in habit improvement.

Many subjects identified electronics as a reason for not sleeping more and use of electronics was the most common area in which students hoped to change behavior in the future. This suggests that although electronics are an important part of this generation's life, these subjects are motivated to change their relationship with electronics in order to better their sleep. These findings suggest the need in this population for increased screening tools, education, and intervention regarding the usage of electronics and their impact on sleep.

The PHQ-9 tool identified moderate or more severe depression in several students, most of whom were not previously receiving mental health care. These students were referred for appropriate care.

Limitations of this study include sample size (18), subject gender (1 boy, 17 girls), and self-report method. A longitudinal follow-up survey would show whether the lessons and effects of this course persist.

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