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(RESEARCH ARTICLE)

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The effect of sleep effectiveness on examination scores of first year osteopathic medical students

Sultan Akbar *, Zaid Mateen, and Younis Sutari

A.T. Still University - School of Osteopathic Medicine in Arizona (ATSU-SOMA).

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Abstract

Medical students frequently encounter high levels of stress and pressure, which can negatively affect their mental health and sleep quality, a key determinant of cognitive function and academic success. This study assesses the relationship between sleep effectiveness and academic performance among medical students. An observational, cross-sectional survey took place at A.T. Still University - School of Osteopathic Medicine in Arizona (ATSU-SOMA), involving participants from the 2027 cohort. The Pittsburgh Sleep Quality Index (PSQI) questionnaire was used and exam scores from the second exam of the fourth block were analyzed. For the purpose of our inquiry, the "Sleep Effectiveness" component score of the PSQI was used for our analysis.

The results indicated a significant inverse relationship between sleep effectiveness and exam performance (R^2 = 0.087, p =0.000262), demonstrating that increased sleep effectiveness was associated with lower exam performance. The study highlights the sheer amounts of confounding variables in the preconceived notion that ",Sleep is the key for academic success."

This research suggests that academic performance is best explained by multiple variables rather than simply one. Future studies should investigate the long-term effects of sleep deprivation and explore interventions beyond sleep hygiene, including stress and time management strategies. Understanding the broader impact of sleep on medical education is essential for fostering better outcomes for students in both academic and clinical settings.

Keywords: Academic performance; Medical education; Memory consolidation; Sleep timing; Sleep quality

1. Introduction

Medical students face an immense amount of stress and pressure throughout their education and clinical training, which can significantly impact their mental health, particularly their sleep quality. Sleep is a fundamental human necessity, on par with eating, breathing, and other basic physiological needs (1, 6). Sufficient sleep—typically 7 to 8 hours for most adults—is crucial for maintaining physical and mental health. Lack of adequate sleep can lead to various negative consequences, including fatigue, difficulty concentrating, impaired cognitive function, and ultimately diminished academic performance (5). These effects are particularly concerning for medical students who are often required to engage in extended study sessions, especially in their preclinical years, which can disrupt their sleep patterns and quality (1).

Sleep plays a vital role in memory consolidation and cognitive restoration. A meta-analysis of seventy studies confirmed that acute sleep deprivation significantly impairs cognitive functions such as attention, working memory, and short-term memory (2). Moreover, research highlights that sleep is crucial for maintaining working memory capacity, a key

* Corresponding author: Sultan Akbar

component of academic success. During the highly demanding period of medical school, many students struggle with poor sleep quality, insufficient sleep duration, and irregular sleep-wake schedules, all of which can harm their learning and memory performance (3,4). Despite being in one of the most learning-intensive phases, medical students often do not meet their sleep needs, posing risks to their academic achievements and overall well-being (3).

2. Methods

This observational, cross-sectional survey was conducted at A.T. Still University - School of Osteopathic Medicine in Arizona (ATSU-SOMA) to assess the relationship between sleep habits and academic performance. The study focused on the second exam of the fourth block, which took place on May 23, 2024. The survey remained open for seven days, concluding on May 31, 2024. Participants included students from the 2027 cohort class. The exam scores were verified and participants de-identified by a FERPA adhering faculty member not directly involved with the project.

Data were collected using the Pittsburgh Sleep Quality Index (PSQI), administered through a Qualtrics survey. In addition to the PSQI, students responded to supplementary questions about their beliefs and perceptions about sleep. All participants provided informed consent, and the study received approval from the Institutional Review Board (IRB). The survey also included evaluating students' academic performance based on their exam results. The sleep effectiveness composite score of the PSQI survey was utilized for this specific inquiry.

The data were analyzed using an r^2 for linear reg and the p-value was computed through a two-tailed T-test. Descriptive statistics were generated for each question to summarize student responses and identify trends or patterns.

3. Results

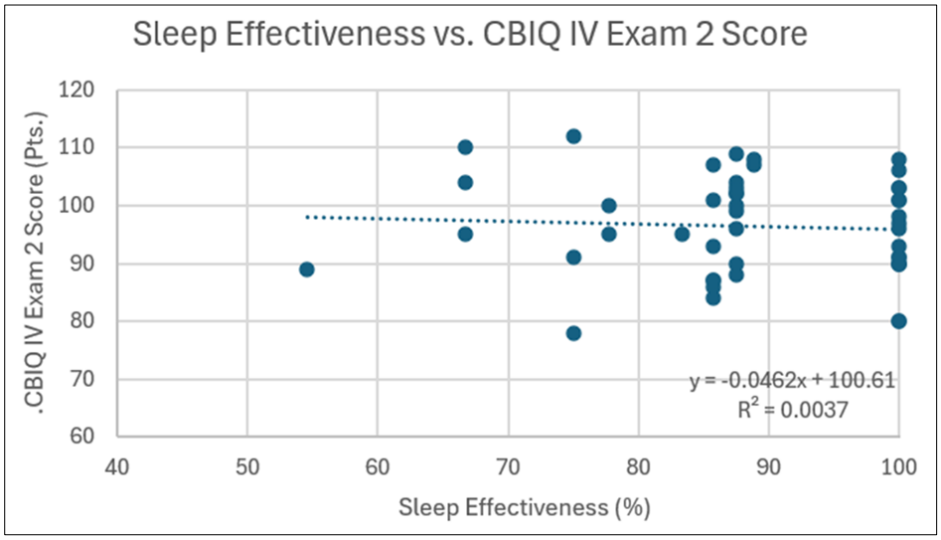

Figure 1 Sleep Effectiveness vs. CBIQ IV Exam 2 Score

The above figure (**Figure 1**) shows a scatter plot attempting to express the variability in participants' CBIQ IV Exam II scores in terms of their sleep effectiveness. A linear regression was then performed and overlaid on the scatter plot (R^2=0.0037). Subsequently, a two-tailed T-test was performed (p=0.000262).

4. Discussion

First and foremost, it is crucial to establish that the greater the sleep effectiveness, the worse the exam score. Following our statistical analysis, our linear regression indicated a negative correlation between the CBIQ IV Exam II score and sleep effectiveness. Our results interjected with the initial hypothesis that poorer sleep effectiveness was associated with decreased exam performance. The results of the two-tailed T-test showed that the variation in CBIQ IV Exam II scores inversely correlated with sleep effectiveness, reaching statistical significance (p = 0.000262).

5. Conclusion

Addressing sleep deprivation among medical students may require strategies beyond improving sleep quality or duration. Further research should explore the long-term consequences of poor sleep behaviors on overall academic performance and mental health while investigating other contributing factors such as stress management, time management, and lifestyle interventions. Since the results contradicted the hypothesis which was initially made, further studies need to be conducted in terms of controlling and manipulating other variables such as personal academic goals, whether or not the lack of sleep was a result of studying more, and the amount of previous knowledge that each person had on the exam's subject. Additionally, there is significant intraspecific variation with the differences of sleep needs from person to person. Additionally, qualitative studies could provide deeper insights into the subjective experiences of medical students regarding their sleep and academic performance. While maintaining sufficient sleep is fundamental for cognitive function, this study highlights the diverse array of other factors that play important roles in academic achievement. Further research is essential to understand how medical education and clinical demands affect sleep and how these sleep patterns impact long-term educational outcomes and student well-being.

Compliance with ethical standards

Acknowledgments

Anna Campbell, PhD (A.T. Still University - School of Osteopathic Medicine in Arizona (ATSU-SOMA)).

Disclosure of conflict of interest

No conflict of interest to be disclosed.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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