

The Impact of Sleep Patterns on Academic Performance and Social Integration among Medical Students

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Abstract

Introduction: The impact of sleep on student life is crucial, particularly for those in demanding fields such as medicine. This study examines the relationships between sleep patterns, academic performance, and social integration among medical students, who often face irregular sleep cycles and sleep deprivation due to rigorous academic demands. **Aim:** This study aims to assess how sleep issues affect academic achievement and social relationships among medical students. **Method:** Data were collected from 215 medical students through surveys and academic records. Quantitative data provided insights into sleep quality and academic performance, while qualitative interviews explored the effects of sleep on social interactions. **Results:** The findings revealed a significant correlation between sleep quality and academic performance, with students reporting better sleep hygiene achieving higher grades. Qualitative data indicated that poor sleep negatively impacts social interactions, leading to feelings of isolation and reduced social participation. **Conclusions:** The study highlights the importance of promoting good sleep practices in medical schools to enhance academic success and social well-being. Interventions aimed at improving sleep quality may help reduce burnout and improve overall well-being among medical students. Future research should focus on longitudinal studies to better understand the long-term effects of sleep on academic and social outcomes in this population.

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Keywords

Student, Medicine, Sleep Quality, Academic Performance

1. Introduction

The impact of sleep patterns on academic performance and social integration among medical students is a critical area of study due to the prevalence of poor sleep quality in this population [1] [2]. Research has shown that factors like high learning intensity, clinical tasks, emotional challenges, and lifestyle choices contribute to sleep deprivation, leading to detrimental effects on cognitive, psychosocial, behavioral, and physical health [3]-[5]. Studies have highlighted a significant correlation between sleep quality and academic performance, emphasizing the need for interventions to improve sleep habits among medical students to enhance their academic outcomes [6]. Additionally, the relationship between sleep patterns and social integration underscores the importance of addressing sleep disturbances to promote overall well-being and success in medical education. Different sleep patterns have a significant impact on medical students' academic performance [7]. Research has shown that morningness chronotypes are associated with better academic outcomes, including higher marks, increased health-related quality of life, and reduced daytime sleepiness. Conversely, eveningness chronotypes have been linked to lower marks among medical students [8]. Studies have highlighted the prevalence of poor sleep quality among medical students, emphasizing its detrimental effects on academic performance and the correlation between sleep quality, academic achievement, and stress levels [9]. The subjective sleep quality and sleep disturbances increase with the progression of years in medical school, potentially impacting students' grades [10].

2. Materials and Methods

Study Design and Participant Selection: In this retrospective study, 215 medical undergraduate students participated, comprising 180 students from the Faculty of Medicine at “Grigore T. Popa” University of Medicine and Pharmacy in Iasi, Romania, and 35 students from the Faculty of Medicine at “Titu Maiorescu” University in Bucharest, Romania. Participants ranged in age from 19 to 25 years, with a gender distribution of 67% female and 33% male. Students were in their first to sixth years of medical school. Participants who consented to participate received questionnaires during June-July 2023. The questionnaires were distributed on paper by the authors of the research. They were anonymous, and all conditions of safety and freedom were ensured during their completion. Subject data privacy and security were also ensured. The data were used in the dissertation thesis of the first author of this article. Therefore, ethical committee approval was not required, as the study only involved the use of questionnaires.

Inclusion criteria required participants to be full-time medical students, aged 19 - 30 years, and willing to participate in both the survey and interview components of the study. Exclusion criteria included students with diagnosed sleep disorders unrelated to academic stress, those on medications affecting sleep, and those unwilling to participate in both data collection methods. No students met these exclusion criteria. Our study adhered to ethical standards, ensuring the well-being and rights of all participants in accordance with the principles outlined in the Declaration of Helsinki. This study did not receive any financial support.

Data Collection Instruments: The Romanian version of the Pittsburgh Sleep Quality Index (PSQI) comprises 19 items grouped into seven components: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction. Each item is rated on a 4-point scale. The Romanian version of the Epworth Sleepiness Scale (ESS), a self-administered questionnaire, consists of 8 items assessing the likelihood of dozing off or falling asleep during specific daily situations, with responses rated from 0 to 3.

Data Collection Process: Surveys incorporating the PSQI and ESS were distributed to participants on paper. Students were instructed to complete the questionnaires based on their experiences over the past month. Upon completion, the data from the questionnaires were collected and compiled into a database for analysis.

Data Organization and Analysis: The responses from the PSQI and ESS were organized into tables using Microsoft Excel. PivotTables were utilized to categorize and summarize the data, allowing for an examination of the proportions of various responses for each component. Statistical analyses were conducted to identify correlations between sleep quality, as measured by the PSQI and ESS scores, and academic performance, as indicated by students' grades. Additionally, qualitative data from interviews were analyzed to assess the impact of sleep quality on social interactions and participation.

Visualization and Presentation of Results: The analyzed data were visualized using charts and graphs created in Excel to clearly present the findings.

3. Results

The PSQI results among medical students indicate a high prevalence of 40.9% reporting poor sleep quality, with varying degrees of sleep disturbances. Data analysis revealed that approximately 75% of students who sleep at least 7 hours a night and over 95% of those who sleep 8 or 9 hours a night rate their sleep quality as very good (Figure 1). These findings align with existing literature on the ideal sleep duration for optimal sleep quality [2].

Notably, an interesting result emerged for students who sleep 10 hours per night, with about 89% of them also describing their sleep quality as very good. This observation suggests that the ideal sleep interval could potentially be extended

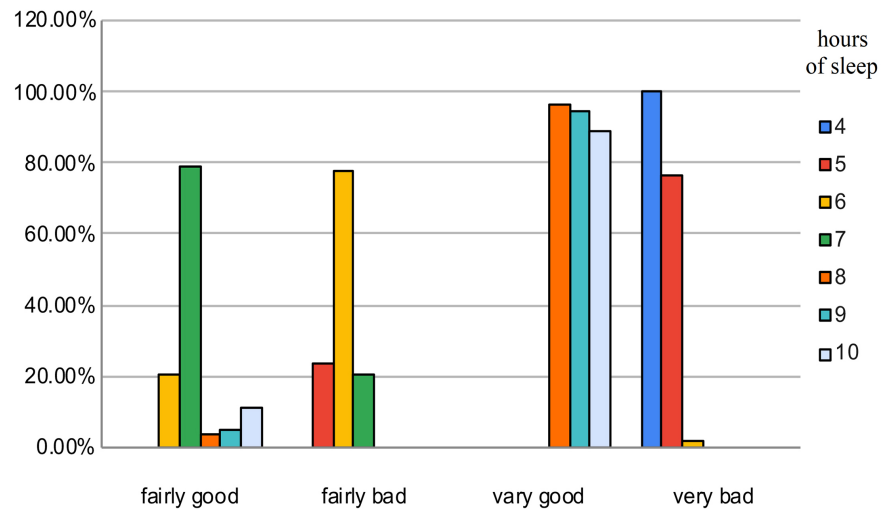


Figure 1. Sleep quality according to sleep duration.

to 7 - 10 hours, accommodating a broader range of sleep needs for optimal sleep quality.

The study explored the relationship between sleep quantity and sleep quality, revealing a robust correlation between the two factors. Every student who slept only 4 hours per night reported their sleep quality as very poor. Similarly, 75% of students who slept just 5 hours per night also rated their sleep quality as very poor. These findings underscore the critical importance of obtaining an adequate amount of sleep to maintain good sleep quality.

Motivation and energy are critical aspects of learning and academic performance. In our study, we analyzed the importance of these factors and explored the well-documented relationship between sleep deprivation and decreased motivation and energy.

Our findings revealed that 100% of students who reported sleeping between 8 and 10 hours per night found it easy to maintain their energy levels and motivation throughout the day to accomplish their tasks. Therefore, the optimal sleep range to preserve motivation and energy is between 8 and 10 hours per night. Conversely, a decrease in sleep quantity negatively impacts energy and motivation. Approximately 81% of students who sleep only 7 hours per night reported finding it somewhat difficult to maintain their energy and motivation, with this figure rising to 74% for those sleeping only 6 hours (**Figure 2**). These results support the theory of a direct correlation between the amount of sleep and levels of energy and motivation [11].

Among severely sleep-deprived students, 100% of those sleeping only 4 hours per night and 80% of those sleeping only 5 hours reported that it was very difficult to maintain an optimal level of energy and motivation throughout the day. This underscores a direct link between sleep deprivation and a lack of motivation and energy, highlighting the importance of adequate sleep for maintaining high levels of both.

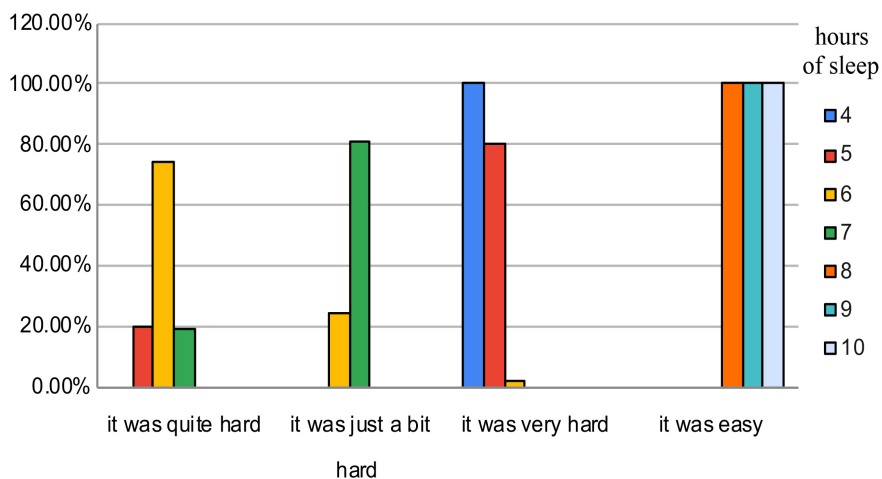


Figure 2. The relationship between sleep quality and maintaining energy and motivation.

Analysis of the responses received shows that at least 73% of people who did not experience any pain for one month reported “very good” or “good” quality of sleep. In contrast, the majority of responses from students who reported having pain less than once a week were split between “very poor” and “quite bad” sleep quality. Although those who confirmed pain once or twice a week accounted for a small percentage, only 1.85% of the total, almost all of them reported “very bad” or “fairly bad” quality of sleep during that month.

These findings underscore a clear association between pain frequency and sleep quality, suggesting that higher levels of pain correlate with poorer sleep outcomes.

We also investigated the impact of continuous sleep disturbances for various reasons on overall sleep quality. Our findings reveal that over 60% of students who rated their sleep quality as “very good” experienced no awakenings during the night or early morning throughout the analyzed month. In contrast, approximately 60% of those who reported “very poor” sleep quality admitted to experiencing awakenings three or more times per week. Participants who reported “quite good” sleep quality were typically awakened less than once a week, whereas those with “fairly poor” quality experienced awakenings once or twice a week. This analysis underscores the significant influence of nighttime awakenings on perceived sleep quality.

The PSQI questionnaire assessed daytime sleepiness (**Table 1**) as a comprehensive experience, including the propensity to fall asleep during activities such as driving, eating, or socializing. The results indicated that over 92% of individuals sleeping between 8 and 10 hours reported no tendency to fall asleep in such situations. In contrast, approximately 81% of those who slept 7 hours per night reported experiencing this tendency less than once a week. As sleep duration decreased, daytime sleepiness increased significantly. Specifically, 70% of those sleeping only 6 hours tended to experience this tendency twice a week, while 70% of those sleeping 4 or 5 hours reported it occurring three times a week.

Table 1. Daytime dysfunction risk: PSQI vs ESS.

Daytime dysfunction (after hours of sleep)	PSQI questionnaire (% of N = 215)-episodes/week	ESS questionnaire (% of N = 215)-episodes/week
10		25% < 1
9	8% < 1	
8		50% - 1
7	81% < 1	60% - low to moderate risk
6	70% - 2	60% - moderate risk
5		
4	70% - 3	65% - moderate to high risk

In the ESS questionnaire, daytime sleepiness symptoms (**Table 1**) while driving for extended periods without a break revealed surprising trends. Approximately 75% of individuals who slept 9 hours per night reported no chance of falling asleep under these conditions, whereas about 50% of those sleeping 8 hours believed there was a slim chance. Among students sleeping 7 hours nightly, opinions varied: some perceived low chances of falling asleep, while others indicated a moderate risk. For those with only 6 hours of sleep, 60% acknowledged a moderate risk, with the remainder split between low and high risks. The majority of individuals sleeping 4 or 5 hours reported moderate to high chances of falling asleep in such situations. These findings suggest a clear link between sleep deprivation and an increased likelihood of experiencing daytime sleepiness symptoms.

4. Discussions

The study underscores the variability in sleep requirements among medical students, with a notable percentage reporting very good sleep quality across a range of sleep durations. This highlights the necessity for personalized sleep recommendations and suggests potential benefits of extended sleep durations warranting further investigation. Our findings consistently support the assertion that a nightly sleep duration of 7 - 10 hours may optimize sleep quality among medical students.

Furthermore, our study elucidates the profound repercussions of inadequate sleep on overall well-being and academic performance. Chronic sleep deprivation correlates with impaired cognitive function, reduced concentration, and heightened stress levels. These findings underscore the imperative for students to prioritize sufficient sleep within recommended durations to bolster their academic and personal lives. Our study aligns with existing literature advocating for adequate sleep as fundamental to health and well-being.

Moreover, our research underscores the critical role of adequate sleep in maintaining motivation and energy levels crucial for effective learning and academic performance. The observed correlation between sleep duration and these

factors underscores the pervasive influence of both sleep quality and quantity on daily student functioning. Notably, students consistently reporting high levels of energy and motivation typically sleep between 8 and 10 hours nightly, reinforcing the optimal sleep duration for sustaining these attributes. Conversely, diminishing sleep quantity correlates with decreased energy and motivation levels, with a significant proportion of students experiencing challenges maintaining these vital aspects of academic success.

Extending beyond individual academic outcomes, existing literature consistently highlights the deleterious impact of severe sleep deprivation on cognitive performance, including memory and concentration [12]. Studies have demonstrated that individuals suffering from insomnia exhibit slower information processing and reduced accuracy in cognitive tasks [13].

In our study, we explored the relationship between nightly sleep hours and academic performance, as measured by exam session averages. Our findings underscore that the highest academic achievement, with mean scores surpassing 9, was predominantly attained by students averaging 8 hours of sleep per night, and to a slightly lesser extent, those averaging between 9 and 10 hours. This reinforces the notion that peak academic performance is most consistently achieved within this sleep duration range. Conversely, as sleep deprivation becomes more pronounced, academic averages markedly decline. A significant majority of students averaging 6 to 7 hours of sleep per night achieved scores between 8 and 9, with fewer attaining scores above 9. Similarly, those averaging 4 to 5 hours per night typically achieved scores between 7 and 8, illustrating a clear association between substantial sleep deficits and compromised concentration and learning capabilities. These findings underscore the indispensable role of adequate sleep in fostering academic success. Ensuring students receive sufficient sleep not only enhances cognitive abilities but also supports overall academic performance. Future research should prioritize the development of interventions and strategies aimed at promoting healthy sleep habits among students, thereby optimizing learning outcomes and overall well-being.

This study highlights the critical importance of optimal sleep duration, specifically between 8 and 10 hours, in maximizing academic performance. Our findings underscore a robust correlation between sleep quantity and academic success, underscoring the essential nature of prioritizing adequate sleep to achieve peak academic potential.

Furthermore, our study underscores broader implications of sleep hygiene on overall well-being. Sufficient sleep enhances cognitive functions such as memory, concentration, and problem-solving abilities, while also improving mood and reducing stress levels. These factors collectively contribute to a more productive and fulfilling academic experience.

Our analysis further reveals a significant relationship between pain frequency and sleep quality among students. Remarkably, students reporting no pain episodes in a month predominantly described their sleep as “very good” or “good”, suggesting a positive correlation between pain absence and sleep quality. Con-

versely, even sporadic pain occurrences led to poorer sleep outcomes, predominantly categorized as “very poor” or “quite bad”. Specifically, students experiencing pain once or twice a week reported markedly impaired sleep quality, with nearly all describing their sleep as “very bad” or “fairly bad”. These findings highlight the disruptive impact of regular pain episodes on sleep patterns and quality of rest. Addressing nighttime awakenings through strategies aimed at promoting sleep hygiene practices or addressing underlying factors could potentially enhance students’ sleep experiences and overall well-being.

Additionally, insights from both PSQI and ESS questionnaires shed light on how sleep duration influences daytime sleepiness across various activities. These findings underscore the pivotal role of sleep duration in managing daytime alertness and safety, suggesting even minor reductions in sleep duration can heighten the risk of experiencing daytime sleepiness symptoms, thereby compromising performance and safety in daily activities, including driving. To mitigate these risks, interventions aimed at promoting healthy sleep habits among students and the broader population are paramount. Education on the significance of adequate sleep, strategies for improving sleep hygiene, and addressing underlying causes of sleep deprivation can collectively reduce daytime sleepiness and enhance overall well-being. Future research should continue to explore the intricate relationship between sleep and academic performance, integrating variables such as sleep quality, individual sleep needs, and the impact of additional lifestyle factors. By deepening our understanding of these dynamics, more effective strategies can be developed to support student health and optimize academic success.

5. Conclusion

Enhancing sleep quality is crucial for improving academic achievement and student welfare. The correlation between sleep duration and academic success highlights the necessity for collaborative efforts among students, educators, and policymakers to prioritize sleep hygiene in educational settings. Implementing targeted sleep education programs and flexible scheduling practices aligned with students’ natural sleep patterns could significantly enhance both academic performance and overall well-being.

6. Limitations

Our study acknowledges several important limitations that should be considered when interpreting the findings and their implications. Firstly, individual differences in genetic predispositions, lifestyle factors, and personal circumstances can significantly influence both the quality and quantity of sleep among medical students. These variations may limit the generalizability of our conclusions beyond our specific sample. Moreover, the subjective nature of self-reported responses introduces potential biases, as participants’ perceptions of their own sleep habits and academic performance may differ from objective measures.

Additionally, some questionnaire items relied on third-party input, which could introduce variability due to the availability and accuracy of such reports. Furthermore, our study did not include detailed analyses of crucial variables such as academic stress, dietary habits, and physical activity levels, which are known to interact with sleep patterns and could significantly impact academic performance. The omission of these factors limits the depth of our findings and suggests avenues for future research to explore their roles more comprehensively.

Another limitation is the relatively small sample size and the cross-sectional design of our study. The small sample size may not fully capture the diversity and variability within larger populations of medical students, potentially affecting the generalizability of our results. Moreover, the cross-sectional nature of the study restricts our ability to establish causal relationships between sleep patterns and academic performance. Future research employing longitudinal designs would be beneficial to track changes over time and better understand the dynamic relationship between sleep and academic outcomes.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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