Original article

Connection between Sleeping Disorders among Students and Academic Success

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Abstract

Aim of the study: Objective of this research was to examine whether sleep disturbances affect the academic success of students of the Faculty of Medicine in Osijek.

Methods: The respondents conducted a self-assessment using a sociodemographic questionnaire and the Pittsburgh Sleep Quality Index (PSQI).

Results: It is observed that there is no significant correlation between age, overall academic success and months of work (if the respondents were employed) with the sleep quality index. Respondents from lower years of studies have a higher sleep quality index, therefore worse sleep quality compared to higher years respondents, whereas daily average studying time has proportional values to the PSQI sleep quality index. In other words, the more hours they spend studying, the higher the sleep quality index. Therefore, the quality of sleep is lower. There are no significant differences in the PSQI sleep quality index in relation to the general characteristics, except in the case of treatment by a psychiatrist. Subjects who were treated by a psychiatrist had significantly worse sleep quality compared to other subjects.

Conclusion: There is no significant correlation between sleep disorders and academic success among students. Subjects from lower years of study had higher values of the PSQI and their sleep quality was inversely proportional to the time they spent studying. Subjects who had a psychiatric diagnosis had worse quality of sleep.

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Introduction

Sleep is a physiological state involving temporary loss of consciousness. Although we spend a third of our lives sleeping the exact reason for sleep is unclear. As we age sleep becomes shorter and shallower. Newborns sleep 17 hours daily, middle-aged adults 9, and older adults 7-8 hours, often with naps. Sleep deprivation, particularly lack of REM sleep causes fatigue, confusion, memory issues and cognitive decline. It also disrupts hormonal balance, contributing to obesity (1, 2, 3, 4, 5, 6).

Sleep is divided into non-REM and REM stages. Non-REM sleep consists of four phases distinguished by EEG patterns. In the first phase brain wave frequency decreases while amplitude increases. In the second phase the frequency continues to decrease and amplitude increases, with the appearance of sleep spindles and high-frequency sharp waves. In the third phase deep sleep spindles decrease and brain wave frequency continues to drop with an increase in amplitude. The fourth phase, the deepest level of sleep, is characterized by delta waves—slow, high-amplitude, low-frequency waves. REM sleep on EEG resembles the waking state. Before REM phase muscle tone decreases leading to rapid eye movements. In coma patients EEG shows no non-REM or REM patterns while vegetative state patients display circadian elements on the EEG (1, 5).

Sleep disorders can be triggered by general medical conditions, psychiatric disorders and environmental factors. General medical conditions that cause sleep disturbances are categorized into cardiac, neurological, endocrinological, pulmonary and hematological disorders. Psychiatric conditions associated with sleep disturbances include depression and post-traumatic stress disorder (PTSD) while anxiety disorders may contribute to their onset. Environmental factors that lead to sleep disturbances include stressful life events, shift work, and frequent time zone changes. Conditions such as obstructive sleep apnea, type 1 narcolepsy, idiopathic hypersomnia, and delayed and advanced circadian rhythm disorders can have a genetic basis (1, 4).

Sleep disorders can be classified into primary, caused by endogenous imbalances, including parasomnias and dyssomnias, and secondary, associated with other psychiatric conditions. Sleep disorders can also be categorized as quantitative and qualitative. Quantitative disorders are more common while qualitative disorders often indicate an underlying psychiatric condition. A more recent classification according to the third edition of the International Classification of Sleep Disorders (2014) divides them into six groups: insomnia, sleep-related breathing disorders, central hypersomnias, circadian rhythm disorders, parasomnias and sleep movement disorders (1, 2, 7, 8).

Insomnia is diagnosed when sleep onset takes longer than 45 minutes, total sleep duration is less than six hours or there are at least four nocturnal awakenings. These symptoms must occur at least four times per week for one month. Insomnia is categorized as short-term, often triggered by stress or lifestyle changes, or long-term, frequently associated with medications or comorbidities such as schizophrenia or mood disorders. Initial treatment should focus on non-pharmacological approaches including sleep hygiene education or cognitive-behavioral therapy. Mild insomnia may be managed with antihistamines or melatonin while more severe cases may require benzodiazepines, antidepressants (SSRIs, TCAs) or antipsychotics. Non-benzodiazepine medications are preferred due to a lower incidence of side effects but treatment should be short-term to prevent tolerance and rebound insomnia (1, 2, 9, 10).

Sleep-related breathing disorders include obstructive and central sleep apnea as well as hypoventilation and hypoxemic syndromes. Obstructive sleep apnea occurrs when muscle tone decreases during deeper sleep causing airway obstruction. This leads to reduced oxygen levels and increased carbon dioxide. As a result patients experience fatigue due to less time in slow-wave and REM sleep. Diagnosis is made through polysomnography. Continuous positive airway pressure (CPAP) is recommended to keep the airways open (1, 4).

Central hypersomnias are characterized by excessive daytime sleepiness and may result from prolonged insomnia, atypical depression or psychiatric disorders. They include type 1 and type 2 narcolepsy, drug-induced hypersomnia and idiopathic hypersomnia. Narcolepsy is marked by sudden transitions to REM sleep. Diagnosis requires the tetrad of symptoms: excessive daytime sleepiness, cataplexy, hypnagogic hallucinations and sleep paralysis. Low CSF hypocretin levels confirm type 1. Treatment includes sleep hygiene and medications like modafinil for narcolepsy and sodium oxybate, TCAs, SSRIs, or SNRIs for cataplexy (2, 4, 7, 11).

Circadian rhythm disorders are classified into delayed, advanced and irregular sleep-wake patterns, as well as the non-24-hour sleep-wake disorder which is most common in blind individuals. Shift workers and those with certain psychiatric conditions are more prone to circadian rhythm disruptions while frequent travelers are at increased risk due to crossing multiple time zones. Diagnosis is made through a sleep diary. Treatment depends on the specific disorder. Delayed sleep phase disorder is treated with melatonin before bedtime while advanced sleep phase disorder is managed with evening light exposure (4).

Parasomnias are defined as awakening associated with amnesia. They are classified into non-REM and REM parasomnias based on the timing of occurrence. Diagnosis is made through polysomnography with extended EEG under video monitoring. Benzodiazepines or TCAs are prescribed for non-REM parasomnias while clonazepam and melatonin are used for REM parasomnias (4).

Sleep movement disorders involve repetitive, stereotypic movements during sleep. The two most common are bruxism and restless legs syndrome (Wittmaack-Ekbom syndrome). Patients with restless legs syndrome experience an uncontrollable urge to move their legs and tingling sensations which may spread to the entire leg. To alleviate symptoms mild cases are treated with warm baths or leg massages while more severe cases may require benzodiazepines. Bruxism is treated with oral appliances or clonazepam (1, 2, 4).

Due to the complexity of the system that controls the circadian rhythm, sleep phases and neurotransmitter levels it can be expected that many medications will affect the quality and duration of sleep. Additionally, a general rule is that drugs that enhance aminergic activity over cholinergic activity tend to induce insomnia while those that increase cholinergic activity over aminergic activity tend to cause hypersomnia (1, 5).

Antihistamines through their mechanism of action undesirably block histaminergic neurons in the tuberomammillary nucleus. By blocking these histaminergic neurons modulation of the locus coeruleus and raphe nuclei is impaired leading to the undesirable sedative effect of antihistamines (1, 12).

SSRIs, which are REM suppressors, shorten sleep duration, increase REM latency and may disrupt sleep continuity. However, even with a reduction in REM sleep phase a clinical picture of daytime insomnia is not typically developed (1, 7, 13).

In the Republic of Croatia there is a trend of increased prescribing of benzodiazepines, a medication used to manage various sleep disorders. Although they facilitate falling asleep and shorten the time required to reach deeper sleep, they may reduce the duration of slow-wave sleep and REM sleep and patients may develop anterograde amnesia. Sudden discontinuation of benzodiazepines can trigger a 'rebound' insomnia phenomenon. Prolonged use of benzodiazepines may lead to the development of tolerance (1, 4, 14, 15).

Sigmund Freud proposed that dreams are a reflection of daily conflicts and events, playing a crucial role in memory. Freud's hypothesis was supported among other studies, by research showing that rodents when required to remember spatial arrangements activate the same groups of hippocampal neurons during both the task and sleep. There is also a dual hypothesis emphasizing that during non-REM and REM phases a series of neurological events occur resulting in memory and memory integration. Declarative memory is formed during non-REM sleep, while procedural memory is consolidated during REM sleep. In addition to memory the REM phase plays a key role in mood regulation and the organization of cognitive abilities (1, 4, 16).

Material and methods

This research got the approval of an appropriate ethics committee.

The study is structured as a cross-sectional study.

The study included 100 randomly selected students from the Faculty of Medicine in Osijek, representing all years of study. The research was conducted from February 1, 2024, to May 1, 2024. Data collection was performed electronically using an online survey questionnaire.

A sociodemographic questionnaire and the Pittsburgh Sleep Quality Index (PSQI) were used in the study. The sociodemographic questionnaire collected data on age, sex, year of study, cumulative grade point average (CGPA), current place of residence, number of siblings, presence of psychiatric disorders, presence of physical diseases, positive psychiatric family history, duration of employment during studies, average daily study time, presence of roommates, and whether the participant had repeated an academic year. The PSQI was used to assess sleep quality and collect the following data: bedtime, time taken to fall asleep, wake-up time, sleep duration, presence and frequency of sleep difficulties in the past month, use of sleep-affecting medications in the past month, frequency of problems maintaining wakefulness in the past month, frequency of lack of enthusiasm in the past month, and self-assessment of sleep quality over the past month.

Categorical data were presented as absolute and relative frequencies. The normality of the distribution of numerical variables was tested using the Shapiro-Wilk test. Due to non-normal distribution data were described using the median and interquartile range. Differences in the sleep quality index between two independent groups were tested using the Mann-Whitney U test (with Hodges-Lehmann's median difference and 95% confidence interval) and differences between three or more groups were tested using the Kruskal-Wallis test. The strength of associations was assessed using Spearman's rank correlation coefficient (Rho). All p-values were two-tailed and statistical significance was set at alpha = 0.05. The data were analyzed using MedCalc® Statistical Software version 22.018 (MedCalc Software Ltd, Ostend, Belgium; https://www.medcalc.org; 2024).

Results

General Characteristics of the Participants

The study was conducted on 100 participants, consisting of 45 (45%) males and 55 (55%) females. The majority of participants, 51 (51%) were in their 5th and 6th years of study. The median age of the participants was 23 years with an age range from a minimum of 19 to a maximum of 41 years. A total of 58 (58%) participants live with their families and for 62 (62%) participants the current place of residence is shared with family members. Thirteen (13%) participants have no siblings, while the largest group 55 (55%) has only one sibling. Five (5%) participants have four siblings (Table 1, Figure 1).

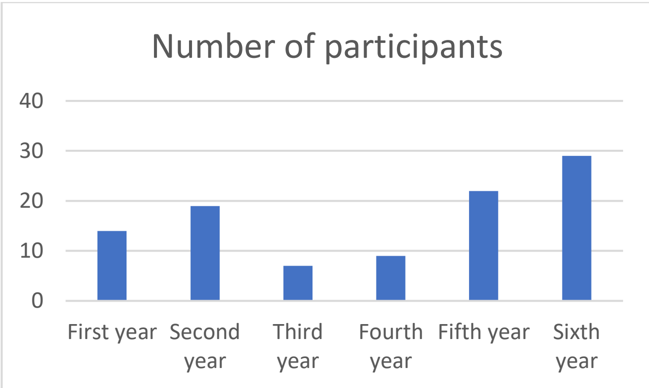

Figure 1. Distribution of participants by year of study

Twenty-three participants (23%) repeated the academic year. The median overall weighted average grade of the participants was 4.10, ranging from a minimum of 3.0 to a maximum of 4.95 (Table 2).

Ten participants (10%) suffer from physical illnesses while six participants (6%) have been examined by a psychiatrist. More pronounced conditions include anxiety-depressive disorders, obsessive-compulsive disorder and mixed behavioral and emotional disorders (Table 3).

Table 1. Participants according to general characteristics

	Number (%) of participants
Sex	
Male	45 (45)
Female	55 (55)
Age of Participants (years) [Median (Interquartile Range)]	23 (20 – 25)
Who do you currently live with?	
Alone	22 (22)
With roommate	13 (13)
With family	58 (58)
With brother/sister	4 (4)
With grandparents	1 (1)
With partner	1 (1)
With own family as a father/mother	1 (1)
Place of current residence	
Coexistence with family	62 (62)
Tenancy	26 (26)
Dorm	10 (10)
Own apartment	2 (2)
How many brothers/sisters do they have in total?	
None	13 (13)
One brother/sister	55 (55)
Two brothers/sisters	21 (21)
Three brothers/sisters	6 (6)
Four or more	5 (5)

Table 2. Participants repeating an academic year and central tendency measure of the cumulative grade point average

Repeated academic year [n (%)]	23 (23)
Cumulative Grade Point Average (CGPA) [Median (Interquartile Range)]	4,10 (3,84 – 4,40)

Table 3. Frequency of physical and psychiatric diseases in participants

	Number (%) of participants
Has physical Illness	10 (10)
Treated by psychiatris	6 (6)
Psychiatric diagnoses of participants (n = 6)	
Anxiety-depressive disorder	2 / 6
Depression, anxiety	1 / 6
Obsessive-compulsive disorder	2 / 6
Behavioral disorder	1 / 6
Mixed behavioral and emotional disorders	2 / 6
Anorexia	1 / 6

Twenty-five participants (25%) reported having a family member who received psychiatric treatment with the most common psychiatric diagnoses in the family being depression in 8 participants (8%) and PTSD in 4 participants (4%) (Table 4).

Table 4. Frequency of psychiatric disorders within the family

	Number (%) of participants
Someone in the family has been treated by a psychiatrist	25 (25)
Psychiatric diagnoses in the family (n = 25)	
Alcoholism	1 / 25
Anxiety-depressive disorder	2 / 25
Bipolar disorder	2 / 25
Dementia	3 / 25
Alzheimer's disease	1 / 25
Suicidality	2 / 25
Delusion	1 / 25
Depression	8 / 25
Insomnia	1 / 25
Recurrent depression	2 / 25
PTSD	4 / 25

During the studies 42 participants (42%) were employed with a median of 7 months ranging from a minimum of half an hour to a maximum of 10 hours (Table 5).

Table 5. Participants based on employment during studies, average months worked and average time spent studying daily

Employed during studies [n (%)]	42 (42)
Duration of employment (months) [Median (Interquartile Range)]	7 (3 – 13)
Average time spent studying daily (hours) [Median (Interquartile Range)]	3 (2 – 5)

Sleep Quality (PSQI)

The Sleep Quality Scale is determined by seven areas: subjective sleep quality, sleep onset latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of pharmacological agents and daytime functioning. The possible range of scores is from 0 to 21 with higher scores indicating poorer sleep quality. The arithmetic mean of the PSQI scale is 4.8 (standard deviation (SD) 2.89). The median total sleep scale score for the participants is 4, ranging from 0 to a maximum of 13 (Table 6).

Table 6. Measures of central tendency and dispersion of the Pittsburgh Sleep Quality Index (PSQI)

	Possible range	Median (Interquartile Range)	Range from minimum to maximum value
Sleep Quality Index (PSQI)	0 - 21	7 (3 - 7)	0 - 13

Association between Sleep Quality and Participant Characteristics

The Spearman correlation coefficient was used to examine the relationship between the sleep quality index and participant characteristics including age, overall weighted average grade, number of months employed and the average daily number of hours spent studying. It was observed that there were no significant correlations between age, overall weighted average grade and months of employment (for those employed) and the sleep quality index. Participants in earlier years of study had a higher sleep quality index indicating poorer sleep quality compared to those in later years of study (Rho = -0.285). Additionally, the average daily number of hours spent studying was proportional to the sleep quality index (PSQI) meaning that the greater the average number of daily study hours the higher the sleep quality indeks and consequently, the poorer the sleep quality (Rho = 0.212) (Table 7).

Table 7. Correlation of sleep quality index (PSQI) with age, year of study, grade point average, months of employment and average daily study hours

	Spearman's correlation coefficient Rho	
	Sleep quality index (PSQI)	**P value**
Age	-0,197	0,05
Year of study	**-0,285**	**0,004**
Cumulative grade point average	-0,063	0,53
Months of employment	0,089	0,58
Average daily study hours	**0,212**	**0,04**

There were no significant differences in the PSQI sleep quality index based on general characteristics except in the case of psychiatric treatment. Participants who had received psychiatric treatment had significantly poorer sleep quality compared to the other participants (median 7 vs. 4) (Mann-Whitney U test, P = 0.04) (Table 8).

Table 8. Correlation of psqi sleep quality index with gender, repeating year, place of residence, and psychiatric diagnosis

	Sleep quality index (PSQI)	Difference (95% confidence interval)	*P**
Sex			
Male	4 (3 – 6)	1 (0 do 2)	0,12
Female	5 (3 – 8)		
Repeating year			
No	4 (3 – 6)	1 (-1 do 2)	0,41
Yes	5 (3 – 8)		
Place of residence			
Living with family	5 (3 – 7)	-	0,72[‡]
Renting	4 (3 – 6)		
Student dorm	5 (1 – 8)		
Own apartment	4 (3 – 4)		
Psychiatric diagnosis			
No	4 (3 – 6)	3 (0 do 6)	**0,04**
Yes	7 (5 – 11)		

Discussion

We examined the relationship between academic performance and sleep quality in the student population. Sleep quality was assessed using the Pittsburgh Sleep Quality Index (PSQI) which evaluates seven domains: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleep medications and daytime dysfunction. The possible range of the index is from 0 to 21, with higher scores indicating poorer sleep quality. A PSQI score greater than 5 indicates poor sleep quality.

The median total PSQI score of the participants in our study was 4, ranging from 0 to 13 (Table 6). The mean PSQI score was 4.8 (SD 2.89).

Given the demanding nature of medical studies, results indicating poorer sleep quality were expected which is also supported by a larger study conducted on 540 medical students in Botucatu, Brazil, where 87.1% of students had a PSQI score greater than 5. Similar results were found in a study conducted in Iran where the mean PSQI score was 6.18 (SD 3.42). Corrêa et al. suggested that the poor sleep quality results, particularly among Brazilian students in the earlier years of their studies may be attributed to the transition from a high school to a university lifestyle which likely influenced the results in our study as well. Waqas et al. conducted a study on medical students in Pakistan revealing an even worse sleep quality with an average PSQI score of 8.1 (SD 3.12). Their primary focus was to demonstrate the relationship between academic stress and sleep quality noting that their student population had a high rate of misuse of sleep medications. Ten percent of their respondents admitted to developing sleep difficulties due to the use of sleep medications which Waqas et al. attributed to the fact that pharmacies in Pakistan sell these medications without a prescription. In conclusion, all three studies showed that medical students in the aforementioned countries had poorer sleep quality compared to medical students in Osijek, likely due to greater awareness of the importance of sleep within the student population in Osijek (17, 18, 19).

Our research involved 100 participants 45 (45%) of whom were male and 55 (55%) female. The median PSQI score for male participants was 4, while the median PSQI score for female participants was 5 with no statistically significant correlation between sex and the PSQI sleep index (P = 0.12).

Considering the well-known link between the female sex and sleep disorders we expected female participants to have higher PSQI scores, indicating poorer sleep quality. Similar results were found by Tang et al., who conducted a study in China involving 26,851 participants. Although women (n = 12,551) had higher values for almost all PSQI components, it is important to note that the difference in sleep disturbances between men and women was not statistically significant (P = 0.232). It is important to consider that the PSQI test is based on self-evaluation and men and women may perceive the overall quality of their sleep differently, which could significantly affect research results. Morris et al. noted that female participants associate sleep quality with external factors that disturb sleep and the consequences of sleep deprivation, such as lack of concentration and daytime sleepiness while male participants associate sleep quality with sleep efficiency and duration. These findings suggest that we should focus on more objective sleep quality assessments to obtain more reliable results in future studies (20, 21).

The largest group of participants in our study consisted of 51 (51%) students from the 5th and 6th years of study. The median age of participants was 23 years with a range from 19 to 41 years. No significant correlation between age and sleep quality index was observed. Sleep quality tends to worsen with age as demonstrated by Minjung et al. They showed that the decline in sleep quality associated with older age is also influenced by the number of comorbidities and long-term medication use. Medications most disruptive to sleep include antihypertensives, bronchodilators, diuretics, beta-blockers, corticosteroids and antidepressants such as SSRIs. These medications are more commonly used by older populations so it can be expected that younger populations will have better sleep quality as they use them less. Since our sample size was relatively small and the study was limited to a student population with a median age of 23 years, with 51 (51%) of participants being in just two consecutive years of study we conclude that the age range of the participants was too narrow to observe a statistically significant decline in sleep quality related to age (22).

In our study 23 (23%) participants had repeated an academic year. The median cumulative grade point average (GPA) of participants was 4.10, ranging from 3.0 to 4.95 (Table 2). No significant correlation between GPA and sleep quality index was found (P = 0.53). Previous studies have shown that sleep disturbances impair memory and cognitive abilities leading to a decrease in academic performance. This was not proven in our study likely due to the small number of participants (n = 100) (1, 23).

In our study 10 (10%) participants had physical illnesses and 6 (6%) had been examined by a psychiatrist. More prominent were anxiety-depressive disorders, obsessive-compulsive disorder and mixed behavioral and emotional disorders (Table 3). Participants who had been treated by a psychiatrist had significantly poorer sleep quality compared to others (median 7 vs. 4) (Mann Whitney U test, P = 0.04) (Table 8).

The statistically significant association between depression and sleep difficulties was expected as it has been well documented. One study conducted on physicians in China involving 1,378 participants showed that physicians with poor sleep hygiene were at higher risk for developing depressive symptoms. A similar study conducted in the United States found a statistically significant correlation between higher global PSQI scores and the risk of developing depressive symptoms. Despite the clear association it cannot be conclusively stated whether poorer sleep quality (higher global PSQI) contributes to the development of depressive symptoms or whether clinical depression promotes the development of poorer sleep quality. Segalàs et al. conducted a study on the relationship between sleep difficulties and obsessive-compulsive disorder (OCD) and found a significant decline in sleep quality in patients with OCD and depression compared to those with OCD alone although both groups had worse sleep quality than the control group. They also concluded that the severity of anxiety and depressive symptoms correlates with poorer sleep quality. This may contribute to the conclusion that each of these two conditions, through their pathophysiology, contributes to the deterioration of sleep quality likely mediated by changes in the balance of monoaminergic neurotransmitters which disrupt the circadian rhythm (24, 25, 26).

The relationship between mixed behavioral and emotional disorders and sleep disturbances was demonstrated by Hosokawa et al. in a study using the Strengths and Difficulties Questionnaire (SDQ) to assess the presence of emotional symptoms, behavioral problems, hyperactivity, attention issues and peer problems. As in the study by Chang et al. it is possible that the symptoms assessed by this questionnaire arose as a consequence of sleep disturbances. Although we found a statistically significant relationship between psychiatric disorders and sleep quality, the small number of participants with psychiatric disorders suggests that further research is needed to confirm the hypothesis of a connection between psychiatric disorders and sleep quality (24, 27).

Participants in the earlier years of study had a higher sleep quality index indicating poorer quality compared to those in later years (Rho = -0.285). Additionally, the daily average number of hours spent studying was proportional to the PSQI sleep quality index, meaning the greater the average number of hours spent studying the higher the sleep quality index, indicating poorer sleep quality (Rho = 0.212) (Table 7). Although the sample size was small this result was unexpected as age is typically proportional to sleep quality. This can be explained by the fact that first-year students, who are still adjusting to the study program, may sacrifice sleep in favor of studying. Since sleep duration is a key factor in the PSQI evaluation these students are likely to have higher PSQI scores which indicate poorer sleep quality. (17, 22).

We should also note that there are several chronotypes that are polygenetically inherited and play a significant role in determining an individual's circadian rhythm. Kalmbach et al. divided participants into early and late chronotypes in their genetic research. Early chronotypes are prone to falling asleep and waking up earlier, with peak productivity during the earlier parts of the day while late chronotypes tend to fall asleep and wake up later, with productivity increasing at night. Since the academic system is structured around early waking hours this can cause chronic fatigue in students with late chronotypes contributing to concentration loss and daytime sleepiness which can promote the development of sleep disorders (16, 28).

Verweij et al. confirmed that sleep deprivation structurally alters neuronal circuits in the prefrontal region leading to a neural network that loses its optimal information-processing capability resulting in reduced working memory. We can conclude that students with late chronotypes will not only have difficulty maintaining concentration but also experience a decline in working memory capacity over time, negatively impacting their academic performance (29).

Conclusion

There is no significant correlation between sleep disorders and academic success among students. Subjects from lower years of study had higher values of the PSQI and their sleep quality was inversely proportional to the time they spent studying. Subjects who had a psychiatric diagnosis had worse quality of sleep.

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Povezanost smetnje spavanja u studenata s uspješnosti studiranja

Sažetak

Cilj istraživanja: Cilj ovog istraživanja bio je ispitati utječu li poremećaji spavanja na akademski uspjeh studenata Medicinskog fakulteta u Osijeku.

Metode: Ispitanici su proveli samoprocjenu koristeći sociodemografski upitnik i Pittsburški indeks kvalitete spavanja (PSQI).

Rezultati: Uočeno je da ne postoji značajna korelacija između dobi, ukupnog akademskog uspjeha i mjeseci rada (ako su ispitanici bili zaposleni) s indeksom kvalitete spavanja. Ispitanici iz nižih godina studija imaju viši indeks kvalitete spavanja, odnosno lošiju kvalitetu spavanja u usporedbi s ispitanicima iz viših godina, dok je prosječno dnevno vrijeme učenja proporcionalno indeksu kvalitete spavanja prema PSQI. Drugim riječima, što više sati provode u učenju, to je viši indeks kvalitete spavanja, odnosno kvaliteta spavanja je lošija. Nema značajnih razlika u PSQI indeksu kvalitete spavanja u odnosu na opće karakteristike, osim u slučaju liječenja kod psihijatra. Ispitanici koji su se liječili kod psihijatra imali su značajno lošiju kvalitetu spavanja u usporedbi s ostalim ispitanicima.

Zaključak: Ne postoji značajna korelacija između poremećaja spavanja i akademskog uspjeha među studentima. Ispitanici iz nižih godina studija imali su više vrijednosti PSQI-a, a njihova kvaliteta spavanja bila je obrnuto proporcionalna vremenu provedenom u učenju. Ispitanici s psihijatrijskom dijagnozom imali su lošiju kvalitetu spavanja.