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RESEARCH ARTICLE

Sleep patterns and quality in university students: characteristics and associated factors

Danilo de S. Vasconcelos, Kellen Vitória S. dos Santos, Débora Cristina L. Viana, Isabeli Tâmara do N. Diniz, Ian Carlos O. Silva, Maria Clara S. T. Borges, Luana Gabrielle de F. Ferreira

Physiotherapy course, Federal University of Delta do Parnaíba (UFDpar), Parnaíba (PI), Brazil

Abstract

Background: Sleep is vital and influenced by factors such as age, lifestyle, and mental health. College students are always faced with challenges that negatively compromise their sleep and well-being. **Objective:** To evaluate sleep quality and associated factors among university students. **Methods:** This was a cross-sectional and quantitative study with 294 students from a public university in northeastern Brazil. Questionnaires on social and health characteristics, the Pittsburgh Sleep Quality Index, the Munich Chronotype Questionnaire, and the Perceived Stress Scale were used for data collection. **Results:** The study included 294 students with an average age of 21.5 years, 52.7% female, 43.7% from the health field, and 56% from the daytime shift. There was a prevalence of 76.5% of poor sleep quality, with the most impacted components being sleep latency, daytime dysfunction, sleep disturbances, and subjective sleep quality. The average sleep duration on school days was 416 min ± 88min, with 69.4% using an alarm clock. The students exhibited a slightly evening chronotype, correlating with greater social jetlag ($r = 0.510$; $p < 0.001$). Students who engaged in physical exercise had better sleep quality (7.9±3.5 vs 9.2±3.9; $p = 0.005$) and lower stress levels (22±6.1 vs 24.6±6.7; $p < 0.001$). Additionally, poor sleep quality was also correlated with higher stress ($r = 0.326$; $p < 0.001$) and eveningness ($r = 0.244$; $p <0.01$). **Conclusion:** The study highlights the high prevalence of poor sleep quality among university students, correlated with stress and eveningness. Physical exercise improves sleep quality and reduces stress, demonstrating its importance for student health.

Keywords: Sleep quality; chronotype; stress; exercise; students.

BACKGROUND

Sleep is the physiological, reversible and temporary state necessary for all humans. The nervous and endocrine system influences it, capable of changing the state of consciousness, body temperature, cardiac activity and hormonal production. It consists of the phases of sleep without rapid eye movements (NREM) and rapid eye movements (REM)[1]. The function of sleep to conserve energy includes the replacement of brain glycogen, hormonal secretion, and being a period in which memories can be consolidated[2]. The changes in sleep hours from childhood to adulthood are quite noticeable, with young people having an average sleep duration of 6.5 to 8.5 hours and, as people age, there is a loss in the duration and maintenance of this sleep[3,4]. Several factors can influence sleep characteristics, such as age, sex, sleep and wake patterns, lifestyle habits, work schedule, presence of a partner and health status[5].

In the specific case of young university students, the transition to adulthood, with academic obligations combined with work and social routines, can impact mental, physical and sleep health[6]. The literature has already described the sleep behavior of

Corresponding author Danilo de Souza Vasconcelos
Email: dan.sv14@gmail.com

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university students, as is the case of a study carried out in northeastern Brazil on 209 students in 2018, in which they observed severely altered sleep. The same students showed greater changes in cardiovascular risk factors analyzed about students with normal sleep, with a positive relationship between sleep quality and all factors investigated[7].Other studies with university students have demonstrated a diversity of influences on sleep quality, including psychosocial, environmental and behavioral factors[8,9]. Furthermore, during the COVID-19 pandemic, education systems were affected, where university students in distance learning noticed a worsening in their sleep quality, a reduction in the practice of physical activities and an increase in the use of electronic devices in the preceding hour. to sleep[10]. During the pandemic period, a high number of musculoskeletal complaints were also identified among students and stress was also considered another very common problem among students, especially in women and those who have poor sleep[11].

Another variable that impacts university students is stress, which results from the mental or emotional tension that occurs when a person faces challenging or demanding situations that are perceived as exceeding their ability to deal with them. emergence of sleep disorders such as insomnia[12]. Lack of adequate sleep leads to more irritable or unmotivated people, and bad habits such as excessive consumption of caffeine, alcohol or food, excessive use of technology, among others, directly influence in this exhaustion, as inadequate sleep patterns result in a reduction in the quality of rest, which in turn can lead to a lack of motivation, fatigue and stress[3,13,14].

The importance of assessments, screening, and diagnosis of sleep disorders cannot be overstated. Early identification of these problems is crucial as they can significantly impact an individual's quality of life and general health. Detailed clinical assessments, complementary exams, and specific questionnaires can lead to an accurate diagnosis of these disorders. Once diagnosed, the role of multidisciplinary health care becomes paramount in the management of these conditions. Health professionals from different specialties, such as doctors, psychologists, physiotherapists, and nutritionists, can contribute with integrated approaches to the treatment of sleep disorders, underscoring the severity of these conditions and the need for comprehensive care. Considering that university students until recently faced the challenge of remote teaching due to the Covid-19 pandemic and that currently students are in face-to-face classes, there is a need to re-evaluate and update the literature on the standard, quality of sleep and associated factors in university students. Therefore, the objective of this research is to evaluate the sleep behavior of university students, as well as identify factors that may affect sleep.

METHODS

The study used a transversal and quantitative methodological approach. The research participants were students from the Federal University of Delta do Parnaíba (UFDPar), located in the city of Parnaíba, (PI), Brazil. The ethics committee approved this research using the CAAE approval protocol: 69546923.1.0000.0192, which is in accordance with the standards of resolution 466/12 of the National Health Council. All research members authorized their participation through the Term of Free and Informed Consent.

A formula was used to calculate qualitative variables in a finite population to determine the sample size. A total population of 4,348 university students was considered, and the literature indicated a prevalence of poor sleep quality of 82.5%[15]. As a result, the minimum sample calculated was 212 university students. However, the study was completed with a final sample of 294 students.

The inclusion criteria were designed with fairness and integrity in mind. They included age greater than or equal to 18 years, of both genders and being officially enrolled in one of the institution's undergraduate courses. Students who were away from classes for a prolonged period (≥ 10 days) at the time of data collection or in the last 30 days were excluded, as well as those who did not completely fill out the data collection instruments, ensuring the data's accuracy and reliability.

The instruments used in data collection are described below.

I. The Student Social and Health Characterization Questionnaire (SSHCQ) evaluates participants' various demographic and social aspects. This questionnaire covers age, gender, marital status, undergraduate course, class schedule, professional occupation, involvement in physical activities, and average cell phone use and time, which are essential data to provide a comprehensive understanding of University students' profiles.

II. The Pittsburgh Sleep Quality Index (PSQI) is a user-friendly assessment instrument designed to analyze sleep quality and disturbances over a 1-month period. The standardized and easy-to-understand questionnaire, developed by Buysse and validated in Brazil by Bertolazi, distinguishes between those who sleep well and those who have difficulty sleeping. It consists of 19 questions that the individual answers themselves to assess their quality of sleep, in addition to 5 questions that must be answered by roommates or bedmates. These additional questions, intended for clinical use, provide further insights into the individual's sleep pattern. The questions are grouped into seven different components, each rated on a scoring scale of 0 to 3, making it simple for the user to interpret the results. By adding the scores of these seven components, a global score is obtained that ranges from 0 to 21. A higher IQSP score indicates worse sleep quality, and when the global IQSP score exceeds 5, this suggests greater difficulties in at least 2 of the components assessed or moderate difficulties in more than 3 components[16,17].

III. The Munich chronotype questionnaire consists of an instrument to assess sleep patterns subjectively and quantitatively, including direct questions that ask participants to describe their sleep routine, detailing each step from the moment they go to bed, the time you decide to sleep, how many minutes it takes to fall asleep, what time you wake up, whether or not you use an alarm clock, even the minutes it takes to get up. Furthermore, it is important to highlight that these questions are asked separately for school days and days off: weekends. In addition to evaluating sleep patterns, this

instrument makes it possible to identify individual chronotypes, classifying them on a scale of extreme morningness=0, moderate morningness=1, slightly morningness=2, intermediate=3, slightly afternoonness=4, moderate afternoonness =5, up to extreme afternoon=6, as well as allowing the assessment of the degree of social jet lag, providing a detailed analysis of the mismatch between natural (or preferred) biological sleep times and the times imposed by social and professional commitments, classified in hours, 0-1 hours: Low social jetlag, 1-2 hours: Moderate social jetlag, 2-3 hours: High social jetlag, More than 3 hours: Very high social jetlag[18,19].

IV. Stress Perception Scale (SPS) is used as an instrument to assess the level of stress that individuals perceive in their lives, that is, it measures the degree to which they perceive situations as stressful. In short, it consists of 10 questions with answer options ranging from zero to four (0 = never; 1 = rarely; 2 = sometimes; 3 = almost always; 4 = always), for questions with a positive connotation, the The score is inverted and added as follows: 0=4, 1=3, 2=2, 3=1 and 4=0, and the other questions are negative and their scores are added directly. The total scale score is obtained by adding the scores of the 10 questions, resulting in scores ranging from zero to 40[20].

Data collection for this study took place during breaks between classes on the UFDPar campus. Students in health, social, biological, education, exact sciences, and engineering were covered from July to August 2023. The students were taken to a classroom, where they received information about the study's objectivesstudy's objectives and were invited to fill out the questionnaires. The data were initially organized in a spreadsheet in Microsoft Excel version 8.0 or later. They were then exported to the Statistical Package for Social Sciences version 24 (SPSS V. 24), (IBM SPSS Statistics for Windows, Version 24.0. Armonk, NY: IBM Corp.).

The variables were described using percentages, mean and standard deviation. The analysis of categorical data, such as physical exercise and sleep quality classification, was carried out using the Chi-square test to measure association, with the results presented in percentage format (descriptive). After evaluating the normality (Kolmogorov-Smirnov) of continuous variables, a comparative analysis was performed using the Mann-Whitney test and Spearman correlation test. A confidence level of 95% and a significance level of 5% ($p < 0.05$) were adopted.

RESULTS

In this study, 294 university students were involved with an average age of 21.5 ± 3.6 years, 52.7% female, 43.7% from the health course, 56% from the day shift, 81.3% reported doing cell phone use for more than 3 hours and an average stress score of 23.18 ± 6.6 was observed. Table 1, below, shows the characteristics of the students.

Table 1. Social and health characteristics of university students

Variables	Number	%
Sex		
Feminine	155	52,7
Masculine	139	47,3
Graduation course		
Health	128	43,7
Exact and engineering	78	26,6
Biological	33	11,3
Social and applied	39	13,3
Education	15	5,1
Class shift		
Daytime	164	56
Nocturnal	15	5,1
Day and Night	114	38,9
Employment relationship		
Yes	50	17
No	244	83
Have children		
Yes	7	2,4
No	286	97,6
Daily cell phone usage time		
< 2h	9	3,1
2h – 3h	46	15,6
> 3h	239	81,3
Practice physical exercises		
Yes	157	53,4
No	136	46,3
Have you ever had Covid-19?		
Yes	26	8,8
No	268	91,2

Note: h = hour.

Regarding the sleep pattern, students had a sleep duration during class days of 06h:56min ± 01h:28min, while on free days the sleep duration was 08h:15min ± 02h:28min with a social Jetlag of 1 .4h ± 1.3h. Furthermore, 69.4% of students reported using an alarm clock to wake up on school days and only 18.7% reported using it on free days. Regarding sleep quality, poor sleep quality was observed in 76.5% of students. Furthermore, the mean PSQI score was 8.5 ± 3.7 and the domains of sleep latency, daytime dysfunction, sleep changes and subjective sleep quality had the highest scores, as shown in Table 2. Regarding chronotype, an average score of 4.31 ± 1.6 was observed, demonstrating a "slightly evening" chronotype. Figure 1 and 2, below, show the distribution of students regarding chronotype based on the Munich questionnaire and the correlation between chronotype and social Jetlag ($r = 0.510$; $p < 0.001$).

Table 2. Characteristics of university students' sleeping and waking times according Pittsburgh Sleep Quality Index

Sleep pattern	Mean ± Standard Deviation
School days (h:min)	
Bedtime	23:56 ± 01:29
Mid-sleep	03:22 ± 01:15
Wake up time	06:50 ± 01:29
Sleep duration	06:56 ± 01:28
Days off h:min)	
Sleep time	00:44 ± 01:50
Mid-sleep	04:46 ± 01:34
Wake up time	08:48 ± 01:54
Sleep duration	08:15 ± 02:28
Sleep quality Components	
Components	
C1 – Subjective quality of sleep	1,42 ± 0,8
C2 – Sleep latency	1,58 ± 1,0
C3 – Sleep duration	0,88 ± 1,0
C4 – Usual sleep efficiency	1,33 ± 1,5
C5 – Sleep changes	1,45 ± 0,6
C6 – Use of sleep medications	0,25 ± 0,65
C7 – Daytime dysfunctions	1,54 ± 0,74
Escore PSQI	8,48 ± 3,72

Note: PSQI = Pittsburgh Sleep Quality Index; h = hour; min = minute.

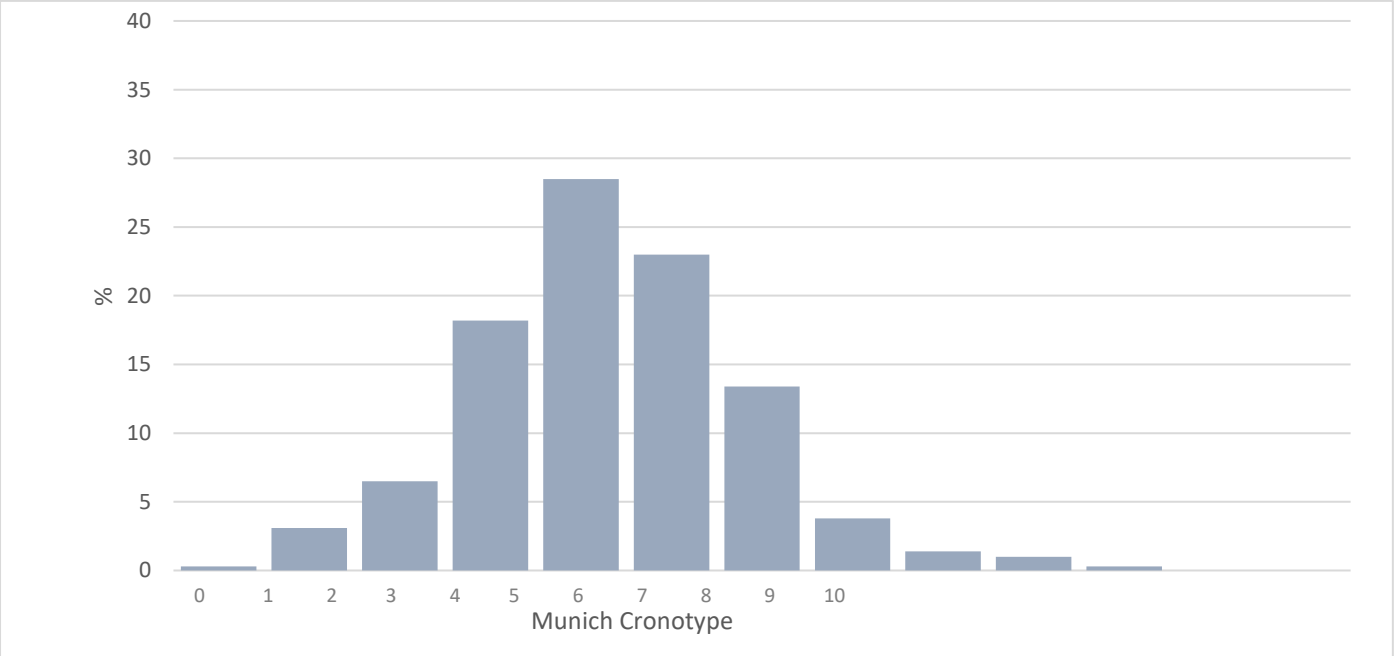

Figure 1. Distribution of frequency in percentage of chronotype of university students

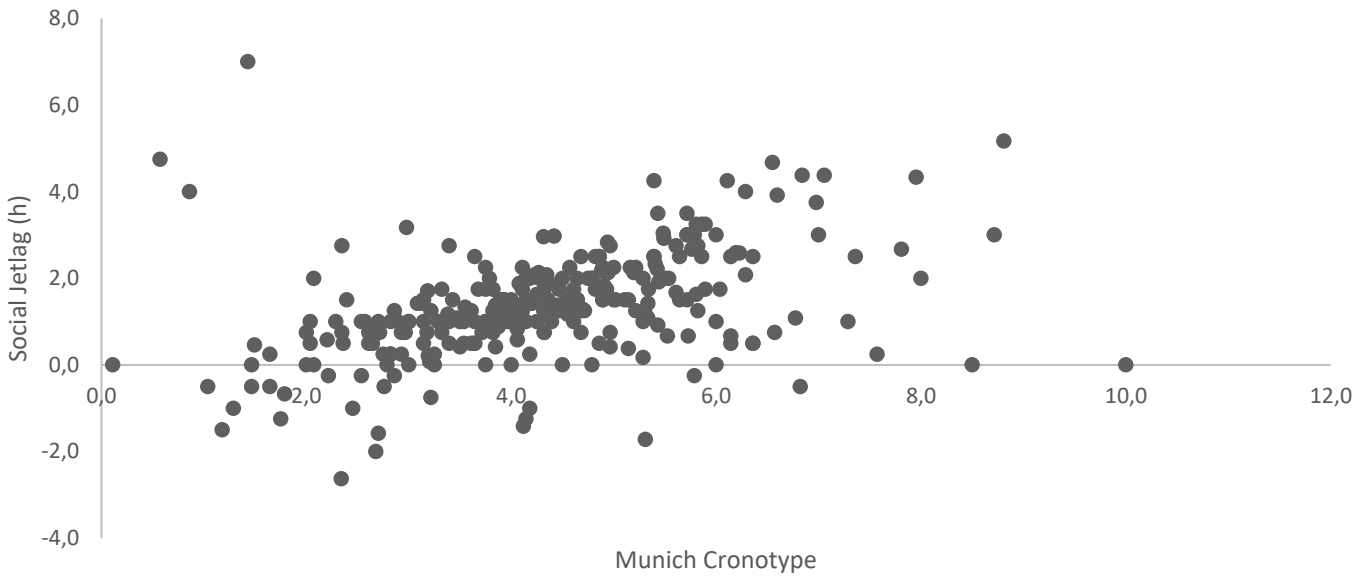

Figure 2. Relationship between the variables Social Jetlag and the chronotype of university students

In the analysis of potential factors that may impact the pattern and quality of sleep, there was no association between gender, class shift and time spent using a cell phone with sleep variables. As for students who practice physical exercise, a lower PSQI score was observed (7.9±3.5 vs 9.2±3.9; $p = 0.005$), an association between exercise practice and good sleep quality ($X2 = 6.56$; $p = 0.038$) and lower stress score (22±6.1 vs 24.6±6.7; $p < 0.001$). A correlation was also observed between the PSQI score and the stress score ($r = 0.326$; $p < 0.001$), sleep duration ($r = -0.462$; $p < 0.001$) and chronotype score ($r = 0.244$; $p <0.001$). .01).

DISCUSSION

In this study, a low sleep duration was observed during school days with a tendency to compensate on free days. There was a high prevalence of poor sleep quality, with the domains sleep latency, daytime dysfunction, sleep changes, and subjective sleep quality. Sleep with more significant losses. The students presented a slightly afternoon chronotype, correlating with more significant social jetlag. Students who practice physical exercise had better sleep quality and less stress; poor sleep quality was also correlated with greater stress and lateness. Regarding sleep duration, the findings of this research are similar to the findings of Araújo (2013)[21], who investigated university students in Fortaleza (CE) Brazil, and found that the so-called "bad sleepers" had an average of 6 hours of sleep and 45 minutes, representing 58% of students. In the most recent study by Souza (2021)[22], which also addressed the number of hours slept, it was observed that 74.8% of students reported sleeping six hours or more, as shown by Lima (2019)[23] with more than 60%. However, although the data present a certain similarity, it is crucial to highlight that the starting time of classes at the institution where the research was conducted differs from the conventional standard, starting not at 7:00 or 7:30, as is common, but yes at 8:00 in the morning. This fact may be due to the ability of these students to guarantee a period of sleep that approaches 7 hours a day.

This study also observed a high prevalence of poor sleep quality. It is known that sleep quality is a crucial aspect of health and well-being, and its importance has been increasingly discussed in scientific literature. The worrying finding made is corroborated by specific research, such as that carried out with undergraduate nursing students, where more than 80% of participants were classified as having poor sleep quality, as Oliveira 2020[24] demonstrates that a significant proportion of individuals, around 65.3%, have an inadequate sleep profile, from Silva et al. (2020)[25] obtained in students in the fourth period of 73.33% and in the 6th period of 78.26% and as well as the conducted by Fernandes[26] amid the covid-19 pandemic with 78.16% of participants presenting a score >5. The results presented corroborate previous studies that indicate a significant prevalence of poor sleep quality among students; the mean PSQI score studied is consistently above the cutoff point suggested to indicate good sleep quality, in which the students investigated, reflected by the mean PSQI score was 6.1±2.4 in Bahia (BA) Brazil, and 6.5±2.6 in Paraíba, in both studies, a significant portion of participants, 72% in Bahia and 61.5% in Paraíba, presented scores indicative of poor sleep quality[27,28].

When analyzing sleep quality using the PSQI, the most affected components among students were subjective sleep quality, sleep latency, sleep changes, and daytime dysfunction. The high score in each of these components denotes an intrinsic interaction of physical, psychological, and environmental factors contributing to the poor quality of sleep observed in students. A subsequent study focused on the profile of students enrolled in public and private institutions corroborated these findings, revealing a notable prevalence of the same components, reflecting a marked propensity of participants to face challenges related to sleep quality, including difficulties falling asleep and the manifestation of dysfunctions, during the day[29]. Furthermore, Paul et al. (2023)[30] indicated a higher prevalence in the same components related to sleep quality; this includes an increase in the time needed to fall asleep, a higher incidence of sleep disorders, and a reduced willingness for daily activities.

The domain that significantly contributed to the high rate of sleep problems in the study is sleep latency, defined as the time interval between the time the lights are turned off and the onset of the first stage of sleep[1]. The high daily use time of mobile devices, with around 81.3% of students using their cell phones for more than three hours daily, is a significant factor for the health of these students, as a considerable portion tends to switch off the lights. Still, the use of cell phones continues, thus creating a contradictory stimulus that interferes with the process of falling asleep. This conflict between induced darkness and light exposure can result in a significant prolongation of the time required to initiate sleep, thus compromising sleep quality and duration. This pattern of behavior may be one of the predisposing factors for sleep disorders identified in this research. Studies confirm that individuals who engage in online activities for periods of 2 to 3 hours a day, especially at night, are more susceptible to experiencing sleep disorders[31].

The chronotype of research students, determined by each individual's biological rhythm, plays an important role in allocating sleep periods during study days and free days. This preference was verified with the Munich Questionnaire, with the majority of students showing a slightly afternoon chronotype. This chronotype indicates a tendency to sleep and wake up later, associated with the subjective sensation of better productivity

and alertness in the afternoon or at night[32]. The eveningness of the students in this research contributes to the sleep debt on school days, considering that they are subject to an early awakening on school days. In this study, the tendency to be late was correlated with an increase in social jetlag. Social jetlag is the result of delayed bedtimes and wake-ups on free days and the need to wake up early on school days, leading to an internal desynchronization of biological rhythms that can impact increased sympathetic nervous system activity, blood pressure, the immune system, and in other bodily functions[7]. Students with an afternoon preference may be more susceptible to pathophysiological processes of a chronic, non-transmissible nature due to this internal desynchronization[33,34]. The findings show that students who consistently adhere to regular physical activity demonstrate a notable advantage in terms of both sleep quality and emotional well-being compared to their less active peers. This phenomenon is in line with the conclusions outlined by Han et al. (2021)[35], who explored the impact of physical exercise on the mood and sleep quality of university students during the COVID-19 pandemic, whose results indicate that active participation in physical exercise is correlated with an improvement in sleep quality and a substantial increase in the emotional health of college students.

According to Shanbhog and Medikonda (2023)[36], the detection of stress and the prediction of sleep quality in an academic environment were addressed in a methodological review, where the mismatch between internal circadian rhythms and external social commitments can be a considerable source of stress for individuals. This chronic sleep dysregulation can trigger stress responses in the body, such as increased cortisol levels. Additionally, the psychological stress resulting from struggling to adjust to social schedules can lead to mental health problems, including anxiety, depression, and irritability. This information corroborates the findings of the present research with the observation of a correlation between increased stress scores and sleep quality, as well as the correlation between the tendency towards the afternoon chronotype and high PSQI scores indicating poor sleep quality. These results highlight the interaction between stress, sleep duration, and chronotypic preferences in determining sleep quality, as assessed by the PSQI.

CONCLUSION

The present study significantly highlights the prevalence of poor sleep quality among university students, a phenomenon already documented in the scientific literature. Likewise, students who tend to be late in the afternoon showed greater social jetlag, suggesting a mismatch between their academic and social activity schedules and their natural biological rhythms. Furthermore, the sleep quality score was related to stress, short sleep duration, and eveningness. Interestingly, those who practiced regular physical exercise demonstrated better sleep quality and lower stress levels, reinforcing the importance of physical activity as a positive modulator of sleep and well-being. Therefore, the need for health and institutional interventions that integrate time management, the chronobiology of young university students, the promotion of physical exercise, and behavioral and psychological interventions to improve the sleep of university students is emphasized.

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