Sleep Quality and Perceived Stress among Students during Online Education

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Abstract

Background: Recently, online education has been gaining prominence in university life. Our survey aimed to examine sleep quality and perceived stress levels among students at the University of Faisalabad, Faculty of Health Sciences.

Methods: A cross-sectional, quantitative, descriptive survey was conducted between February and March 2023. The online survey included the internationally validated Athens Insomnia Scale (AIS) and Perceived Stress Scale (PSS). Statistical analysis involved descriptive statistics, independent t-tests, analysis of variance (ANOVA), and Mann–Whitney and Kruskal–Wallis tests ($p < 0.05$).

Results: We analyzed 304 responses, and females dominated (n = 270; 88.8%). Students in a relationship had significantly higher AIS scores (t = −2.470; $p = 0.014$). Medium average (2.50–3.49) students and those who rarely/never exercise showed significantly higher AIS and PSS ($p \leq 0.05$).

Conclusion: Students on the phone/watching a series during online education, daily laptop/TV use for more than 2 h, and pre-sleep use of smart devices for more than 60 min also negatively affected AIS and PSS scores ($p \leq 0.05$). Nursing, physiotherapy, and radiography students were the most affected regarding insomnia and perceived stress ($p \leq 0.05$). Our survey shows that excessive smart device use and lack of exercise are associated with higher stress levels and poorer sleep quality.

Keywords: sleep quality; perceived stress; Athens Insomnia Scale; Perceived Stress Scale; student; smart device; online education

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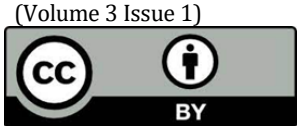

Introduction

Sleep hygiene is the combination of behavioral and environmental factors to improve sleep quality. Most recommendations focus on factors such as caffeine consumption, smoking, duration of physical activity, stress, and nighttime light and noise conditions [1]. It is crucial to stress that not only those with insomnia but also the general public should steer clear of these elements as they have a detrimental effect on the quality of their sleep. Lack of sleep is linked to the emergence of mental health disorders, malignant illnesses, and cardiovascular ailments. [1,2]. University students often experience suboptimal sleep quality, characterized by irregular sleep patterns and insufficient durations. The demands of academic life, including exams and assignments, contribute to elevated stress levels, potentially disrupting the natural sleep–wake cycle [1,2]. The widespread use of electronics, especially right before bed, exposes kids to obstructive blue light, which makes it harder for them to sleep. Inconsistent nighttime patterns are frequently the outcome of social and extracurricular activities combined with the ability to create personal schedules. An inability to fall asleep and a disturbed sleep architecture might result from excessive caffeine and stimulant usage, which

is common among students. Furthermore, the occurrence of mental health issues like sadness and anxiety makes sleep disturbances even worse in this group of people [3,4].

The phases of sleep can be divided into two major groups i.e. the non-rapid eye movement (NREM) phase and the rapid eye movement (REM) phase. When alcohol is consumed before bed, especially in the latter part of the night, the NREM phase lengthens and the REM period shortens. In addition to decreasing blood saturation levels and reducing sleep continuity, polyuria and an increased risk of snoring are associated with obstructive sleep apnea. The circadian rhythm is disrupted by alcohol because it lowers melatonin levels and attenuates the typical diurnal variations in body temperature. [5,6].

Globally, the use of the internet has grown in the twenty-first century, offering improved chances for communication, administration, education, and information retrieval. University students were more likely to develop dependent during the COVID-19 pandemic due to the mandated increase in daily internet usage length. Using smartphones right before bed causes the gray matter in our brains to atrophy and the quality of our sleep to decline, which impairs our memory, learning, and attention. [7,8].

Physical inactivity resulting from internet addiction has negative implications for both physical and mental health, influencing our daily activities, such as increasing neglect of household chores [7]. Lack of regular physical activity and a sedentary lifestyle greatly raise the chance of developing obesity, which is increasingly becoming a public health concern. Teenagers who struggle with their self-esteem are also a result of Western societies' stereotyped portrayals of men as strong and women as slender. [9,10].

Apart from extraneous variables, there is a proven two-way relationship between mental health and the quality of sleep. The institution itself is one of the main sources of stress for college students. Exam frequency, peer competition, high expectations from parents and teachers, and an abundance of study material all contribute to pupils' psychological disruption (anxiety, sadness) [11,12].

Perceived stress among university students is a widely researched phenomenon, often assessed through validated psychological instruments. High academic demands, including exams and assignments, contribute significantly to elevated perceived stress levels [12]. Factors such as uncertainty about the future, financial pressures, and social challenges also play roles in shaping students' subjective experiences of stress. The impact of perceived stress on mental health and academic performance underscores the importance of targeted interventions and support services for this population [11–13].

Students' use of smart gadgets has increased due to the rise in popularity of online education in higher education. University students' experiences, unique situations, and the characteristics of the online learning environment can all influence how well they sleep and how stressed they feel as a result of their online education. The home environment, increasing screen time, social isolation, technological hurdles, and online schooling can all have an impact on how sleep and stress levels are affected. [7,10].

In our country, citing the economic situation caused by inflation and the war crisis, in February and March 2023, online education took place for a period of 8 weeks. For students, the concept of online teaching became familiar during the waves of the coronavirus, and experiences varied, with some having a positive while others having a negative impact. Therefore, our survey aimed to examine the sleep quality and perceived stress levels during online education among students at the University of Lahore, Faculty of Health Sciences.

Cross-sectional, quantitative, descriptive data collection was carried out. We included in our survey students with active student status who were studying in the following programs at the university: radiography, laboratory science, physiotherapy, nursing, and emergency medical services. The data collection did not involve questions to identify respondents, ensuring their confidentiality. Each respondent was initially informed about the survey process, and a consent statement was also filled out. Completing the questionnaire was voluntary, and respondents could discontinue at any point during the survey.

The survey was conducted between February and March 2023 among students of the Faculty of Health Sciences at the University of Lahore. Our questionnaire was distributed to each student via email in the form of a newsletter sent by the University of Lahore, Faculty of Health Sciences. Also, the questionnaire was shared in relevant social media groups of the mentioned specialties.

Methods:

The first section of the online questionnaire contained sociodemographic information such as age, gender, field of study, and the previous semester's grade point average. Questions regarding physical activities were also conducted. Students' mobile phone and internet usage were assessed, they were asked about daily internet usage, and time spent watching movies, computer use, and phone use during classes. They were also inquired about sleep hygiene habits that included activities before bedtime.

The Athens Insomnia Scale (AIS), which is freely available and is a self-assessment questionnaire to assess sleep disorders. The scale measures the level and severity of sleep disorders, like insomnia. The AIS aims to evaluate individuals' overall sleep quality and sleep difficulties. The scoring system allows for comparing results and determining the severity of sleep disorders. The questionnaire consists of 8 questions, each question has 4 answer options. Responses are scored from 0 to 3, resulting in a total possible score of 24. Four major groups can be defined based on the severity of sleep disorders. Individuals with a total score between 0 and 5 are considered to have minimal or no sleep disorders. Those who score between 6 and 10 might be experiencing mild sleep disorders, these individuals typically face periodic issues. Scores between 11 and 15 are considered moderate insomnia. A total score between 16 and 24 indicates severe sleep problems impacting mental and physical health [14].

The Perceived Stress Scale (PSS) is also freely available individuals can evaluate how much stress do they feel daily. The PSS is a self-assessment questionnaire consisting of 10 questions designed to measure the level of emotional stress based on situations and reactions experienced in the span of last one month. By aggregating the results, the PSS is suitable for estimating an individual's perceived stress level. The questions are scored on a scale ranging from 0 to 4. Three groups are distinguished based on the total score: below 19 indicates a low stress level, between 19 and 32 suggests a moderate level, and above 32 indicates a high stress level [15].

Statistical Analysis

The Statistical Package for the Social Sciences (SPSS) version 23.0 was used during the statistical analysis. Descriptive statistics, independent sample t-tests, analysis of variance, correlation, and linear regression were ran for data analysis. If non- parametric distribution was noticed, the Kruskal–Wallis test was employed. The results of the statistical tests were considered significant at a 95% confidence interval ($p \leq 0.05$).

Results

Sociodemographic Results

There were 2012 active students in the Faculty of Health Sciences at the University of Lahore during the survey. After screening the questionnaires for irrelevant data, only 304 student responses were used for the analysis (response rate 15.10%). Each response indicated a student enrolled in the undergraduate programs in the Faculty of Health Sciences at the University of Lahore, specializing in radiography (16.8%), laboratory science (8.2%), nursing (17.4%), physiotherapy (39.8%), health visitor (7.9%), or paramedics (9.9%).

The vast majority of respondents (88.8%; n = 270) were female. The proportion of those in a relationship (55.3%) and those who are single (44.7%) was nearly equal (Table 1). First-year students were most willing to complete the questionnaire (37.2%). We defined two major categories based on the previous semester's average. Students in the larger group (n = 269; 88.5%) had a semester GPA above 3.5. Regarding the frequency of physical activity, 54.3% of respondents reported to be engaged in regular sports, while 5.3% were the students who do not devote time to physical activity in their leisure time (Table 1).

A total of 52% (n = 158) of respondents believed that online education is only suitable for theoretical learning, but at the same time, 74.3% (n = 226) indicated that they got distracted often (Table 1).

The majority (n = 113; 37.2%) spend 1–2 hrs watching TV daily. 39.8% of the respondents (n = 121) reported to be spending more than 30 mins browsing the internet before bedtime. A total of 84.5% of the sample (n = 257) spend more than 2 hrs daily on smart devices. Total students who rarely read before bedtime were 46.4% (n = 141), 41.1% (n = 125) of the respondents reported that they consume coffee regularly, and 85.5% of the sample (n = 260) do not smoke (Table 2).

Statistical Connections between Athens Insomnia Scale and Perceived Stress Scale Results

Students achieved an average score of 5.91 (SD = 3.79) on the Athens Insomnia Scale, with a reliability of 0.874.

Most students had no sleep disorder (n = 147 (48.4%); AIS 2.80 (SD = 1.63)). A total of 118 (38.8%) students had a mild sleep disorder (AIS 7.50 (SD = 1.40)). Moderate insomnia was represented among 35 (11.5%) students (AIS 12.68 (SD = 0.96)), and only three (1.0%) students were seen to have severe sleep problems (AIS 17.11 (SD = 1.01)) (Table 2).

The average score on the Perceived Stress Scale was 28.31 (SD = 10.35), with a reliability of 0.910.

Most students experienced moderate stress levels (n = 126; 41.45%; PSS 25.96 (SD = 3.25)). High stress levels closely follow, constituting 36.84% of the sample (n = 112; PSS 39.29 (SD = 4.93)), while low stress levels account for 21.71% (n = 66; PSS 14.5 (SD = 3.94)) (Table 3).

There was a positive, moderate strength correlation (r = 0.548; r2 = 0.358) between AIS and PSS values (p = 0.001).

There are significant differences in the average values of the Perceived Stress Scale (PSS) based on the categories of the Athens Insomnia Scale (AIS) (F = 34.305; p = 0.001). Students without any sleep disorders had the lowest PSS score of 23.42 (SD = 9.63). The group of students with mild sleep disorders had a mean score of 31.33 (SD = 8.32), while those with moderate insomnia had a mean score of 38.62 (SD = 8.53). The group of students with a severe sleep disorder had a mean score of 28.66 (SD = 1.52) (Figure 1).

Possible Predictors of Insomnia

Students in relationships (6.39±3.91) had significantly higher AIS scores than those who were single (5.32 ±3.57) (p = 0.014). No significant differences were found between the genders of the students (p = 0.075) (Table 1).

Nurses appeared to be the most affected by sleep disorders (6.45±3.81), while health visitors were the least affected (4.00±2.32) (p = 0.044). Students at the beginning of their studies had better sleep quality. According to our results, students' sleep quality seems to deteriorate continuously as their university years progress, although we did not find significant differences between the categories (p = 0.068) (Table 1).

We found a significant connection between the previous semester's academic average and sleep quality (p < 0.001). Those with a moderate average (2.5±3.49) achieved signifi- cantly lower AIS scores (8.69± 4.19) compared to those with an academic average of 3.5 or above (5.55± 3.59) (p < 0.001) (Table 1).

The aspects of online education, specifically related to theoretical courses, did not significantly impact students' sleep quality (p = 0.242). Almost three-quarters of students (74.3%) reported that they experience distraction during online lectures (Table 1).

Among students who regularly use their phones during online classes, the AIS average score was 8.66±4.47 which significantly deviates in a negative direction compared to those who can pay attention throughout (4.40±3.71) or get distracted (5.8±3.51) (p = 0.001). Daily television and movie watching habits did not significantly influence sleep quality (p = 0.127). However, it is worth noting that students who spend more than 2 hrs daily on these activities had the worst average score (6.97 4.28) (Table 2).

We analyzed the relationship between reading before bedtime, phone usage, and sleep quality. The average AIS score was the lowest for those who do not use the internet before bedtime (2.15±2.15). With the constant increase in pre-sleep internet usage, there was a consistent deterioration in sleep quality (p = 0.001). Pre-sleep reading habits did not significantly impact sleep quality (p = 0.209) (Table 2).

Students engaging in regular physical activity (5.28 ± 3.87) had a significantly lower AIS average score (p = 0.005). Coffee consumption and smoking habits did not significantly affect students' sleep quality (p = 0.342; p = 0.914) (Table 2).

Possible Connections of Perceived Stress

Most students exhibited moderate stress, which can be attributed to the university as a stressor. The PSS score of male respondents (29.14±10.13) was significantly lower than female respondents (p < 0.001). The perceived stress level of students in relationships (29.20±11.05) was higher than single students (27.21 9.35) (p = 0.960) (Table 1).

Significant differences were found among the PSS scores of different specializations (p = 0.001). Nursing students were the most affected (33.08±10.56), while paramedics were the least affected (24.17 10.65). Significant differences were also observed in the number of active semesters. Students in their seventh semester or beyond (32.84± 10.04) had significantly higher PSS scores (p = 0.045). Students with a moderate academic average (35.77±10.59) also demonstrated significantly higher PSS scores compared to those with an excellent average (27.34±9.94) (p < 0.001) (Table 1).

Students engaging in regular sports activities had significantly lower PSS scores than their peers (p < 0.001). Coffee consumption habits did not have a significant effect (p = 0.520), but smoking habits influenced the sample significantly. Students who smoke occasionally had significantly lower PSS scores (p = 0.014) (Table 2).

A higher PSS score was observed among students who prefer online lectures (32.23 8.87) (p = 0.048). Those who could pay attention throughout online classes had significantly lower PSS scores (p < 0.001). Daily use of smart devices for more than 2 h increased student stress levels (29.12 ±10.51) (p = 0.006) (Tables 1 and 2).

Only 17.4% of students read a book before bedtime. However, these students achieved lower overall scores on the Perceived Stress Scale (26.58 ± 8.26) than those who did not read (29.15 ±

10.29). Most students spend more than 30 min on the internet before bedtime. As the pre-sleep internet usage increases, PSS scores also increase in a negative direction ($p < 0.001$) (Table 2).

Discussion

The main goal of our research was to assess the sleep quality and stress levels of students during the online education period at our university. A total of 304 students completed our online questionnaire, including validated and self-designed questions, and the majority were female (n = 270). According to our findings, online education is associated with an increase in daily smart device usage, which correlates with higher stress levels. We identified a positive correlation between the duration of pre-sleep internet usage and AIS scores.

Students who were in relationships had a significantly higher average AIS score than those who were single ($t = 2.470$; $p = 0.014$). Being in a relationship often involves social activities and spending time together. Late-night outings or activities can lead to later bedtimes, potentially affecting the total duration and quality of sleep. Factors such as mattress comfort, room temperature, and noise levels may need to be negotiated to ensure both partners can sleep well [16,17].

As the results indicate, more than half of the students engage in regular physical activity, and the proportion of those who do not dedicate any time to physical activity in their free time is low. Among students with a medium grade point average (2.50±3.49), those who rarely/never exercise showed significantly higher AIS and PSS scores (p 0.05). Similar results were obtained in a study published by Fusz et al., examining the sleep quality of adolescents aged between 12 and 18. Students who performed better in school achieved lower AIS scores ($r = 0.15$; $p = 0.034$). Those who pay attention to healthy nutrition sleep better (4.73 ±3.58) than those who do not pay attention at all (6.57±4.25) ($p < 0.001$) [18]. Less physical activity had a significantly negative impact on both sleep quality and perceived stress. Insufficient physical activity can contribute to disruptions in circadian rhythms, affecting the natural sleep–wake cycle. Regular physical activity has been associated with better sleep efficiency and a more consistent sleep pattern. Students who engage in regular physical activity often report better coping mechanisms for stressors, leading to lower perceived stress levels [19,20].

There is a well-established connection between sleep quality and perceived stress, with poor sleep often exacerbating feelings of stress. Sleep deprivation or disturbances can lead to increased levels of stress [1,12,16]. Our research concurs with previous studies, indicating that there is a moderate, positive correlation between the AIS and PSS scores. This implies that higher levels of perceived stress are associated with poorer sleep quality among students.

Regular watching of a series/phone use during online classes, daily smart device usage exceeding 2 h, and more than 60 min of smart device use before bedtime also negatively influenced AIS and PSS scores (p 0.05). Similar correlations between sleep quality and AIS scores are observed in adolescents [7]. Students who do not use the internet before sleep much better (2.69 ± 2.34) than those who spend more than 60 min

online before bedtime (5.62±4.08) ($p = 0.002$). The constant connectivity and exposure to stimulating content on smart devices may contribute to heightened stress levels, further compromising the overall quality of sleep and well-being. As we delve into the era of pervasive technology, understanding the intricate relationship between smart device usage, sleep quality, and stress becomes essential for promoting healthier sleep habits and overall mental well-being [16,17,21].

Almost three-quarters of the students experience distractions during online lectures, which complicates the later mastery of the material. Most respondents use their smart devices for more than 2 h daily, which is attributed partly to online education and partly to the internet dependence developed during the COVID-19 pandemic. Online lecturing can be susceptible to attention distraction, as students may face a myriad of digital interruptions, such as social media notifications and emails, competing for their focus during virtual classes. Additionally, the absence of physical presence and direct monitoring in online environments may make it easier for students to succumb to multitasking, diminish- ing their ability to fully engage with the lecture content and impacting overall attention retention [2,7,22].

Smart devices emit blue light, which can suppress melatonin production and disrupt circadian rhythms. Using these devices before bedtime may interfere with the natural sleep–wake cycle and contribute to poor sleep quality. Excessive screen time, especially close to bedtime, has been associated with insomnia and difficulty falling asleep. Students who spend more time on their smart devices in the evening may experience disrupted sleep patterns. Some smart devices offer features like night mode or blue light filters that reduce the impact of blue light on melatonin production. These features may be beneficial for users who need to use devices in the evening [21,23,24].

To improve sleep quality, adhering to sleep hygiene rules is essential, as sleep problems contribute to various illnesses and disorders [3]. The results indicate that only 17.4% of students regularly read before bedtime, while most spend more than 30 min online. Background noise and light during sleep increase the feeling of morning fatigue. A negative correlation was also found in adolescents between adherence to sleep hygiene rules and AIS scores ($p < 0.001$). Only 18% of students read a book almost regularly before bedtime, while the majority (47%) do so rarely, and 35% do not [18].

Understanding the link between sleep and cognitive function can motivate students to prioritize their sleep. Universities can organize workshops or provide resources on sleep hygiene. These sessions can cover topics such as creating a sleep-friendly environment, establishing good sleep habits, and addressing common sleep challenges. Universities should offer counseling services to students experiencing stress, anxiety, or other mental health challenges that may impact sleep [22,25]. The impact of reading before sleep can vary among individuals. Some may find it extremely helpful, while others may prefer different pre-sleep activities. While recreational reading can be beneficial, students should be cautious about reading academic material before bedtime. Studying or reading complex material might stimulate the brain and hinder the ability to unwind [26,27].

Regarding our study, nursing, physiotherapy, and radiography students proved to be the most affected in terms of insomnia and perceived stress (p 0.05). The sleep quality and perceived stress among university students pursuing healthcare professions can be influenced by a variety of factors unique to the demands of their academic and clinical training. A heavy academic workload can contribute to stress and potentially impact sleep quality. The demands of hands-on training can be physically and mentally

exhausting, affecting both sleep and stress levels. Some healthcare professions, such as nursing, involve shift work. Irregular schedules and night shifts can disrupt circadian rhythms, making it challenging for students to maintain consistent sleep patterns [28–31].

Higher scores on the AIS and PSS in college students point to possible therapeutic ramifications for mental health providers. These results point to the necessity of focused interventions and support services for university students that address stress management and sleep quality. Putting into practice techniques to enhance coping skills and sleep hygiene may be essential to supporting students' general wellbeing and academic achievement. Furthermore, peer support programs and educational campaigns can help foster a campus climate that values mental health.

It is crucial to recognize a number of limitations in spite of the insightful knowledge this study has provided. First of all, because the study relied on self-reported data, response bias and subjective interpretation of variables like stress levels and sleep quality could have been introduced. Furthermore, the cross-sectional design of the study makes it more difficult to establish causal links between the variables under investigation. The study's narrow emphasis on a single school and student body may further limit the applicability of its conclusions in other, larger situations. Professional development classes that emphasize resilience, mindfulness, and good coping mechanisms can aid students in overcoming the obstacles of their chosen healthcare careers. Future studies utilizing a variety of approaches and more well-known and representative populations would advance our understanding of the intricate interactions between smart devices.

Conclusions

As a result, this study, which looked at a number of complex relationships between variables such as smart device use, sleep quality, and felt stress during online learning, was carried out among university students at the Health Sciences Faculty. The results of the survey showed noteworthy correlations, emphasizing that students who used smart devices excessively had lower-quality sleep and higher stress levels. Especially in the context of online education, these results highlight the significance of putting specific interventions and recommendations into practice to lessen the negative effects of these factors on the population of students' well-being.

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		Online Education		
good in theory	158	52	6.03 (SD = 3.89)	28.43 (SD = 10.48)
suitable in every aspect	31	10.2	6.77 (SD = 3.58)	32.23 (SD = 8.87)
personal is better	115	37.8	5.53 (SD = 3.70)	27.10 (SD = 10.35)
			F = 1.425; p = 0.242 **	F = 3.06; p = 0.048 **
Regarding online education				
getting distracted	226	74.3	5.83 (SD = 3.51)	28.39 (SD = 9.91)
paying attention the whole time	46	15.1	4.40 (SD = 3.71)	22.67 (SD = 9.45)
usually on the phone/watching a series	32	10.5	8.66 (SD = 4.47)	35.84 (SD = 9.97)
			p < 0.001 ***	F = 16.901; p < 0.001 **

Table 2. The relationship between students' smart device use, sleep habits, coffee and smoking habits, and the quality of sleep and perceived stress (** analysis of variance; *** Kruskal–Wallis).

n		**%**	**AIS**	**PSS**
Spending time daily watching TV or watching movies				
max 1 h	45	14.8	5.58 (SD = 3.34)	26.93 (SD = 8.75)
1–2 h	113	37.2	5.35 (SD = 3.27)	27.45 (SD = 10.86)
more than 2 h	66	21.7	6.97 (SD = 4.28)	31.27 (SD = 11.13)
does not watch daily	80	26.3	6.04 (SD = 4.16)	27.86 (SD = 9.47)
			$p = 0.127$ ***	$p = 0.098$ ***
Duration of Internet use before falling asleep				
does not use the internet	13	4.3	2.15 (SD = 2.15)	17.34 (SD = 8.53)
10–15 min	86	28.3	5.21 (SD = 3.41)	26.49 (SD = 9.92)
more than 30 min	121	39.8	5.79 (SD = 4.43)	28.44 (SD = 10.03)
more than 60 min	84	27.6	7.42 (SD = 4.24)	31.69 (SD = 10.04)
			$p < 0.001$ ***	F = 9.431; $p < 0.001$ **
Duration of daily PC, laptop, and tablet use				
max 1 h	8	2.6	6.50 (SD = 5.45)	25.63 (SD = 7.39)
1–2 h	39	12.8	4.97 (SD = 2.92)	23.54 (SD = 8.44)
more than 2 h	257	84.5	6.04 (SD = 3.85)	29.12 (SD = 10.51)
			F = 1.434; $p = 0.24$ **	$p = 0.006$ ***

Table 2. *Cont.*

n	%	AIS	PSS
Reading a book before falling asleep			
yes, almost every night	53	17.4	5.19 (SD = 3.45)	26.58 (SD = 8.26)
Rarely	141	46.4	6.28 (SD = 4.10)	28.31 (SD = 11.07)
does not read books	110	36.2	5.79 (SD = 3.51)	29.15 (SD = 10.29)
			p = 0.209 ***	p = 0.351 ***
		Coffee consumption		
yes, regularly	125	41.1	5.97 (SD = 3.58)	27.65 (SD = 9.40)
yes, occasionally	80	26.3	5.31 (SD = 3.27)	28.41 (SD = 10.83)
does not drink coffee	99	32.6	6.33 (SD = 4.38)	29.07 (SD = 11.13)
			p = 0.342 ***	p = 0.52 ***
		Smoking habits		
yes	24	7.9	5.63 (SD = 4.01)	25.46 (SD = 11.77)
yes, occasionally	20	6.6	5.80 (SD = 4.10)	22.85 (SD = 7.84)
does not smoke	260	85.5	5.95 (SD = 3.79) F = 0.9; p = 0.914 **	28.99 (SD = 10.25) F = 4.357; p = 0.014 **

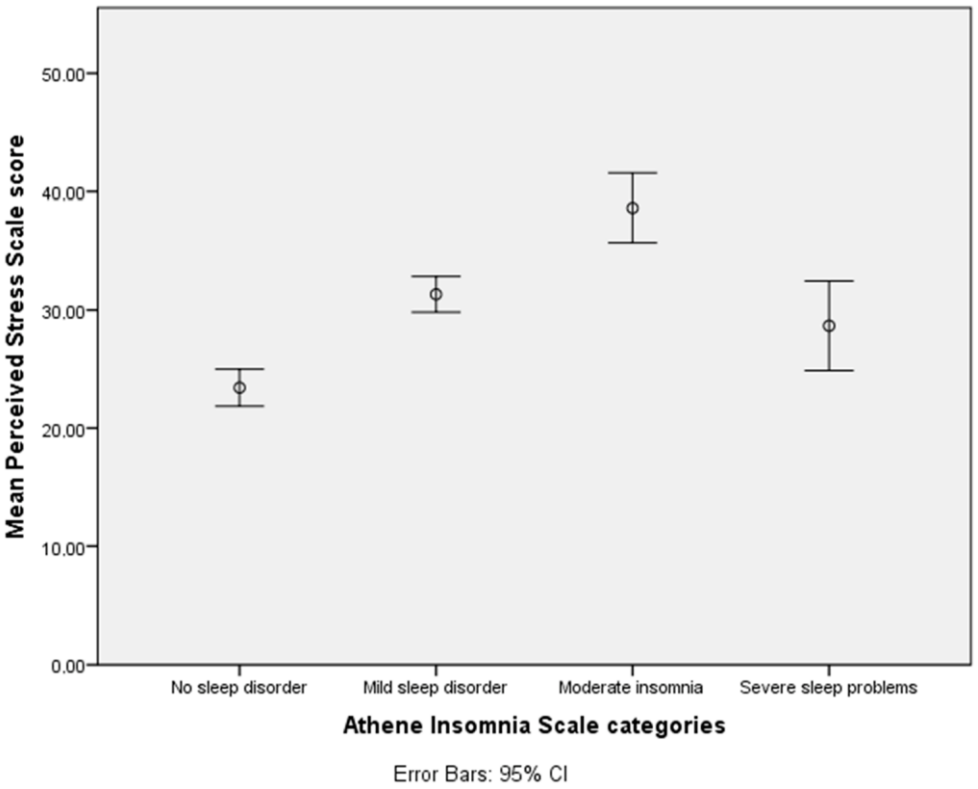

Figure 1. The relationship of the average Perceived Stress Scale values corresponding to the categories of the Athens Insomnia Scale.

Table 3. The average values of the Athens Insomnia Scale and the Perceived Stress Scale, as well as the average values corresponding to the categories.

Measuring Tool	Category	N (%)	Mean (SD)
Athens Insomnia Scale Mean = 5.91 (3.79)	No sleep disorder	147 (48.4)	2.80 (1.63)
	Mild sleep disorder	118 (38.8)	7.50 (1.40)
	Moderate insomnia	35 (11.5)	12.68 (0.96)
	Severe sleep problems	3 (1.0)	17.11 (1.01)
Perceives Stress Scale Mean 28.31 (10.35)	Low stress level	66 (21.7)	14.15 (3.94)
	Moderate stress level	126 (41.4)	25.96 (3.25)
	High stress level	112 (36.8)	39.29 (4.93)