

# Why are Undergraduate Students Sleepy and Sleep Deprived?

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## ABSTRACT

Sleep problems are an increasingly prevalent health condition in modern society and studies have shown that university period is a landmark for sleepiness and poor sleep quality. These sleep changes could be responsible not just for poor academic performance, but also be the cause of health issues, especially mental diseases. Sleep deprivation in university students arises from multiple factors. In this study we aimed to describe social aspects, academic workload and the correlation between daytime sleepiness and the quality of sleep between students of different academic degrees.

This research analyzed the correlation between the levels of daytime sleepiness (Epworth Sleepiness Scale - ESS), sleep quality (Pittsburgh Sleep Quality Index - PSQI) and academic workload and applied a sociodemographic questionnaire to university students. The sample (mean age: 22.2 years, SD=4.4) was made up of 55 students of law, 107 of civil engineering and 167 of medicine. The results of the average daytime sleepiness, researched using the Epworth Sleepiness Scale was 11.5 points (SD= 4.8) in Law, 10.5 (SD= 4.1) in Civil Engineering and 11.1 (SD= 4.1) in Medicine, as the quality of sleep, investigated with the Pittsburgh Index, the results were 8.7 (SD=2.6), 7.1 (SD=2.8) and 8.6 (SD=3.1), respectively. There were no significant differences in sleepiness ( $f=1.1$ ;  $p>0.05$ ) between courses, but in sleep quality there were significant differences ( $f=8.1$ ;  $p<0.00$ ). It was shown that the workload and sleep quality were not correlated in the Law ( $r=-0.05$ ;  $p>0.05$ ), Civil Engineering ( $r= 0.09$ ;  $p>0.05$ ) and Medicine ( $r=0.17$ ;  $p>0.05$ ).

In our sample, we found poor sleep quality and daytime sleepiness, regardless of degree and the workload required by it. Besides the discrepancies of workload and work activities our findings reinforce the idea that the cause of somnolence, poor sleep and sleep deprivation is multifactorial and highly prevalent in undergraduate students.

**Keywords:** Sleep; Undergraduate students; Sleep questionnaires

## INTRODUCTION

The importance of sleep quality, sleep duration and day time somnolence in undergraduate students has been explored worldwide [1-13]. It is known that academic environment and some sociodemographic characteristics interfere in the students' routine, which directly leads to a reduced sleep quality [2,3]. In the last decades, the prevalence of poor sleep quality among university students has increased [4], previous studies point out that this complaint reaches between 10 to 50% of this population [5]. A meta-analysis, which is based on studies done with more than 37 million Chinese students, revealed that 41.3% of them sleep less than 7 hours a day (IC 95%: 35%-47.9%), what is fewer sleep time than Chinese adults, 33.4% [4] showing the high prevalence sleep deprivation in students.

Sleep deprivation in university students arises from multiple

factors; the transition for the university can be a source of stress and anxiety chronically [1-7]. These factors are explored in a study that links sleep duration and its connections to students' health of 26 different countries [3]. Short sleep time and advanced sleep pattern are already usual from adolescence, reflecting in university students' habits [4]. Other possible factors to explain this high prevalence of sleep deprivation in undergraduate students is the absence of parents or adult supervision in this transition time, new social opportunities and commitments, higher level of study and extracurricular activities. All of these factors contribute to irregular sleep time and increase the risk of sleep deprivation. Sleep quality could also be disturbed by excessive consumption of caffeine and energetic drinks, use of new medias such as tablets and phones that can delay the sleep start [4].

Sleep problems like sleep deprivation and the lack of regular sleep

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schedule negatively impact the endocrine and immune system [3,4] learning and memory process [2,8]. Sleep deprived students have lower academic achievement than the ones with regular sleep pattern [2,4,8]. Some studies have shown that low sleep quality is a predictor for depression symptoms as sleep disorders and depression have a bidirectional relation [5]. Sleep problems are also intrinsically related to psychological suffering [9] and moderate to severe anxiety [6]. Other consequence of poor sleep habits is its relationship with the higher consumption of tobacco and alcohol, which increases the risk of developing hypertension, obesity, diabetes, dyslipidemia and mortality [3,5].

Therefore, research on the factors that influence sleepiness and sleep quality in students are very important. This study aims to describe social aspects, academic workload and the correlation between daytime sleepiness and the quality of sleep among students of different academic degrees.

## DEVELOPMENT

### Method

The research was submitted and approved by the Human Research Ethics Committee. The sample was composed of 328 undergraduate students from three academic degrees. The inclusion criteria were: student regularly enrolled in the same institution, studying at 2nd, 8th and 10th semesters of the Civil Engineering and Law (night), while in Medicine: 2nd, 5th and 8th semesters. Exclusion requests were: refusal to sign the consent and not filling out questionnaires. The researchers invited students to participate voluntarily in the research and instructed them on: the objectives of the research and the need to sign the Informed Consent Form (ICF).

For this cross-sectional study, students in the 2nd study semester were considered our baseline. The 8th and 10th semester of Law and Civil Engineering (part-time on night shift) and the 5th and 8th semester of Medicine (full-time) were chosen because they are considered, by the students of the researched university, as the most exhaustive periods at university, due to the heavy workload, mandatory internships and the undergraduate thesis.

The courses chosen for a research were Law, Civil Engineering and Medicine, as the present research had as one of the objectives to analyze whether, even in the face of such different levels of demand and workload, the faculty impacted the students' sleep. Since most of the published research only addressed scientific studies in health students, we would like to compare the results of these with the other areas of knowledge, in order to question whether the main workload required by the medical course is the main one. responsible for negatively impacting sleep, or if in fact there are other more relevant factors involved in poor quality of sleep of university students, which ends up affecting everyone in general, opening room for future more detailed studies in this regard.

Eligible participants completed a sociodemographic questionnaire (identification, gender, age, academic workload and labor, residence, marital status, parenthood status) and sleep related questionnaires: Epworth Sleepiness Scale (ESS) and Pittsburgh Sleep Quality Index (PSQI) this research was carried out during the regular classes.

The ESS is a self-administered questionnaire that the individual informed the chance of falling asleep in eight everyday situations, using a scale from 0 (no chance) to 3 (high chance). A total score greater than 10 is the cut-off point to identify a high chance of

excessive sleepiness [10]. As for the PSQI, it consists of 19 self-administered questions and 5 questions that must be answered by your roommates. The first 19 questions refer to the individual's sleeping habits in the last month; they are grouped into 7 components with grades from 0 to 3. The total scores range from 0 to 21, with results greater than 5, reveal individuals who have poor sleep quality [10].

### Data analysis

Descriptive analyzes were carried out (frequencies, means and standard deviations), the parametric statistics Analysis of Variance (ANOVA) was used to separately analyze the PSQI and the ESS, as the research compares three different groups (Civil Engineering, Medicine and Right) with interval data, random and independent sampling and with normal distribution, which is confirmed by the Kolmogorov-Smirnov test, which was 0.08 ( $p < 0.05$ ) for PSQI and 0.06 ( $p < 0.05$ ) for ESS. After contacting that there was a statistically significant difference between the courses only in PSQI, the post-hoc Tukey Test was applied. At the end, in order to verify if there was a correlation between the workload required by each course and the PSQI that each of these courses presented, because it is the correlation of dependent variables, the Person Correlation Coefficient was chosen.

The present study included a sample of 328 students, among the statistical analyzes carried out on the collected data, it was concluded that only in the PSQI results did the courses show statistical difference, the standard deviation of this sample is 3.0, which when submitted Altman's nomogram reveals that the study's power is greater than 99. The values were considered statistically significant when  $p < 0.05$ . Past (Version: 2.17c) and Action Stat (Version: 3.7) were used to perform the statistical analysis.

## RESULTS

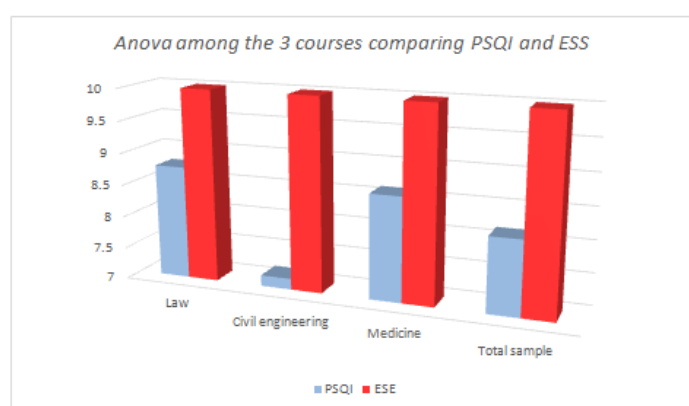
The mean age of the sample was 22.3 years ( $SD=4.4$ ). Gender distribution: 51.2% are women and 48.8% are men. Women are majority in academic degrees of Medicine and Law. Considering labor activities beyond university activities, 12.2% of the undergraduates work up to 6 hours a day, while 27.7% work more than 6 hours a day and 59.7% don't work. In Civil Engineering, 83% of students work 6 or more hours a day. In Law 72.6% work. In Medicine, 98.8% do not work. About parenthood, just 6.7% already have child, 21.8% of law students have children. With respect residence, 80.4% of the samples currently reside at same city than the university. 93.4% of Medical students live in college city, while 34.9% of Engineers Students and 29% of Law students do need travel from their residences to college (Table 1).

The average daytime sleepiness obtained from the Epworth Sleepiness Scale, for the total sample was 10.9 ( $SD= 4.2$ ), whereas for the law course was 11.6 ( $SD=4.8$ ), Civil engineering was 10.5 ( $SD=4.1$ ) and Medicine reached an average of 11.1 ( $SD=4.1$ ). The PSQI scores obtained by the sample were 8.1 ( $SD=2.4$ ) points, where Law obtained an average of 8.7 ( $SD=2.6$ ) points, Civil Engineering had an average of 7.1 ( $SD=2.8$ ) points and in Medicine the average was 8.6 ( $SD= 3.1$ ) points, as can be seen in Graph 1.

The academic workload obtained by the general sample was 485 ( $SD=125.9$ ) hours/semester, while in Law it was 409.4 ( $SD=34.3$ ), Civil Engineering 359.2 ( $SD=110.6$ ) and Medicine 589.9 ( $SD=7.5$ ) hours/semester. The data demonstrate that the periods analyzed by the research present a great discrepancy between them in relation

**Table 1:** Sociodemographic characteristics of the students surveyed (n=328).

Sociodemographic VariableS	Type	Law (N=55)		Civil Engineering (N=106)		Medicine (N=167)		Total Sample (N=328)	
Age		22.4	(SD=5.9)	22.2	(SD=4.2)	22.3	(SD=4.1)	22.2	(SD=4.4)
	n	%	n	%	N	%	N	%	
Gender	Male	21	38.1	75	70.7	60	35.9	160	48.7
	Female	34	61.8	31	29.2	107	64	168	51.2
Labor	≤ 6 hours	13	23.6	25	23.5	2	1.1	40	12.1
	≥ 6 hours	27	49	64	60.3	0	0	91	27.7
Children	No	14	25.4	18	16.9	165	98.8	196	59.7
	No reply	1	1.8	0	0	0	0	1	0.3
	Yes	12	21.8	6	5.6	4	2.3	22	6.7
City	No	43	78.1	100	94.3	161	96.4	304	92.6
	No reply	0	0	0	0	2	1.1	2	0.6
	Cascavel	39	70.9	69	65	156	93.4	264	80.4
City	Others	16	29	37	34.9	11	6.5	64	19.5
	No reply	0	0	0	0	3	1.7	3	0.9

**Graph 1:** ANOVA among the 3 courses comparing ESS and PSQI.**Table 2:** Means and standard deviations of the levels of Excessive Daytime Sleepiness, Sleep Quality and Workload.

	ESS	PSQI	Academic Workload
Law	11.5 (SD=4.8)	8.7 (SD=2.6)	409.4 (SD=34.3)
Civil engineering	10.5 (SD=4.1)	7.1 (SD=2.8)	359.2 (SD=110.6)
Medicine	11.1 (SD=4.1)	8.6 (SD=3.1)	589.9 (SD=7.5)
Total sample	10.9 (SD=4.2)	8.1 (SD=2.4)	485 (SD=125.9)

to the workload, mainly in Law and Civil Engineering courses, as can be seen in Table 2.

After application of ANOVA, it was not found significant differences in sleepiness levels between Law, Civil Engineering and Medicine courses ( $f = 1.1$ ;  $p > 0.05$ ). On the other hand, for the average quality of sleep, significant differences were identified ( $f = 8.1$ ;  $p < 0.00$ ).

In order to verify where the significant differences of the PSQI were found between the courses, the post-hoc Tukey Test was carried out, which identified that there is a significant difference between Law and Civil Engineering ( $p < 0.01$ ) and between Medicine and

**Table 3:** Correlation coefficient (r) for PSQI and workload academic in the courses surveyed.

	Means and standard deviation		
	PSQI	Workload Academic	r values
Law	8.7 (SD=2.4)	409.4 (SD=34.3)	$r = -0.05$ ( $p > 0.05$ )
Civil engineering	7.1 (SD=2.8)	359.2 (SD=110.6)	$r = -0.09$ ( $p > 0.05$ )
Medicine	8.6 (SD=3.1)	589.9 (SD=7.5)	$r = 0.17$ ( $p > 0.05$ )

Civil Engineering ( $p < 0.01$ ), but there is no significant difference between Law and Medicine ( $p = 0.9$ ).

Pearson's Correlation Test was used for the variables "academic Workload" and "PSQI". This revealed that the variables were not correlated: Law ( $r = -0.05$ ;  $p > 0.05$ ), Civil engineering ( $r = -0.09$ ;  $p > 0.05$ ) and Medicine ( $r = 0.17$ ;  $p > 0.05$ ), as can be seen in Table 3.

## DISCUSSION

Our results showed that most undergraduate students suffer from drowsiness ( $ESS = 10.9 \pm 4.2$ ) and poor sleep quality ( $PSQI = 8.1 \pm 2.4$ ) regardless of the university semester and the course they are in. In addition, poor sleep quality does not correlate with academic hours and other factors related to sleep problems in this population remain under discussion. The averages of daytime sleepiness did not show a statistically significant difference between the three academic degrees investigated, since the poor quality of sleep predominates in Law and Medicine courses when compared to civil engineering.

An Indian study with undergraduate students described a sleepiness of  $ESS = 7.2 \pm 2.6$  [11], the present research found the average  $ESS = 10.9 \pm 4.2$  in university students, which is very close to that found in studies conducted with students of medicine in Rio Grande do Norte - Brazil which was  $ESS = 9.4 \pm 4$  [2]. All ESS results are close to the diagnostic value of excessive daytime sleepiness, reinforcing that daytime sleepiness is a reality that is prevalent among university students, as the present study found.

The Pittsburgh Scale to assess sleep quality revealed that the three courses studied had poor sleep quality with an average of 8.1 ( $\pm 2.4$ ), which is very high when compared to the means found

in Ethiopia PSQI=6.3 [6], in Kuwait PSQI=7 [12] and even to Brazilian medical students from the Northeast PSQI=5.5 [2]. Even so, since the PSQI in all studies is higher than 5, it is clear that poor sleep quality is present in most of the university students surveyed.

One of the objectives of this study, after verifying that sleep problems were prevalent in the academic community, was to explore the factors that influenced the poor quality of sleep and the main factor questioned was the relationship between sleep and the workload required by each of the courses. A Brazilian study found significant differences in sleepiness and quality of sleep, depending on the shift taken by the student as night shift students suffer from more sleepiness and lower sleep quality than morning shift students or those who attend full-time lessons [2].

In our sample, Law and the 10th semester of the Civil Engineering course are part-time (night shift), while the 2th and 8th semester of Civil Engineering and all semesters of Medicine are full-time. But even with different workloads, our study found no significant differences in the comparison between the PSQI for Law and Medicine ( $p= 0.9$ ), which suggests that there is no correlation between the workload and poor sleep quality, a fact that is later reinforced by Pearson's correlation coefficient, which shows that there was no statistically significant correlation between these factors in any of the courses studied.

In search of other factors that may be the cause of precarious sleep among university students, a study in São Paulo correlated poor sleep quality to the semester of university degree, and showed that first year students had the worst sleep quality [13]. This finding is reinforced by other studies, one of them developed in Ethiopia showed that the progression of the semester was associated with a decrease in poor sleep quality [6]. As well as another study that revealed that by increasing the year of study, students experience an improvement in all aspects of the university, reflecting an increase in well-being [7]. Therefore, the semester of college in which the student is may be one of the factors that influence the quality of their sleep, and further investigations are valid.

Age and gender can also relate to the amount of sleep. In a survey that compared the sleep of university students around the world, sleep time of 6.8 hours per night was found in young people aged 16 or 17 years, 7.2 hours at 23 and decreased to 6.8 hours between 26 and 30 years. In the same study, being a woman was a predictor of the need for more sleep time [3]. The average duration of sleep can also be influenced by the economic factor as in this same study we found an average of 7.1 hours in low-income students against 7.5 hours in high-income students [3]. The shorter sleep duration in low-income students can be explained by the fact that they need to work to supplement their income and this hypothesis is reinforced by two Brazilian studies, one of which shows that holding a job during university influences the quality and duration of sleep [13], which is complemented by another study that revealed that students who need to work during the week have worse sleep quality than those who just study [14].

In our study, the need to work was predominant in civil engineering and law (60.3% and 49% work more than 6 hours during weekdays respectively) while in medicine 98% of the students do not work. Even so the three samples presented poor quality of sleep, which indicates that even though work is a factor that influences the quality of sleep, it is not the main one, reinforcing the idea that cause of the students' sleep problems is multifactorial. The present research also raised other factors that could influence students'

sleep: social demographic aspects such as marital status, parenthood, and means of transportation, who lives alone or not. Differences were found between the lives profiles of the three samples surveyed, which in the future can be better explored to more clearly trace the real factors that impact university students' sleep.

The limitations of this study are the use of medications or dietary products that could interfere with daytime sleepiness or sleep inhibition (caffeine) was not questioned, nor did we assess patterns of sleep rhythm, physical activities or time of exposure to blue light before sleep. Data was collected from subjective questionnaires with no objective measure, such as actigraphy. On the other hand, the strengths of this research include the fact that it is based on the application of standardized and internationally recognized questionnaires (PSQI and ESS), which makes it possible to compare the results of this research with so many others carried out worldwide, helping to establish which ones are the real factors that affect students' sleep. In addition, this research compares the number of hours required by the courses with the quality of sleep, and proves that there is no statistically significant correlation, which contrasts previous studies that suggest that the higher course workload is the factor that negatively impacts quality of students' sleep, thereby questioning the discussion that students in the health field (Medicine and Nursing) [1,13,15,16] have poor sleep quality due to their extensive workload and sets precedents for future research on the subject.

Another strong point of the research is that the results are clear in showing how the indices of excessive daytime sleepiness and the poor quality and quantity of sleep predominantly affect university students, regardless of the course they are in. That is why the greatest benefit that this research brings is the alert to universities about the need to develop educational and health policies that aim to encourage better sleep habits, since poor quality of sleep directly reflects on students' well-being, leading to negative health outcomes short and long term, which could be avoided with simple actions that encourage the practice of healthy habits.

## FINAL CONSIDERATIONS

The present study found that poor sleep quality and daytime sleepiness are factors that affect our academic community, regardless of the course and workload required by it. And concluding that there is no correlation between the course workload and the poor quality of sleep, our findings reinforce the idea that the cause of drowsiness, lack of sleep and sleep deprivation has a multifactorial origin.

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