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Research Paper

A Cross-Sectional Questionnaire Based Study to Evaluate Subjective Sleep Quality among Undergraduate Students in India

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ABSTRACT

Irregular sleep patterns are often a major hindrance in the life of undergraduate students, fueled by the undulating lifestyle anomalies and new vulnerabilities that come with college life. Insomnia, slapdash sleep cycles, and daytime dysfunction may affect both physical as well as mental well-being of individuals. India has the largest share of young adults in the world, which also makes it a likely epicenter for increasing sleep disorders. Students are often exposed to a significantly high level of academic burden and turn to options such as pulling all-nighters that further propel these issues. Most students realize the effects of a bad sleep schedule but nonetheless sacrifice it for the promise of better grades ignoring the double-edged sword. This study assesses the association of self-rated subjective sleep quality with habits prevalent among undergraduate students in India and its effect on their academic performance. Based on a modified PSQI questionnaire, the participants' sleep quality was scored and a large majority of students showed an overall moderately good sleep quality. Insufficient sleep was seen to have an adverse effect on facial appearance, work productivity and enthusiasm for daily chores, among students. Unlike previous reports, the current dataset did not reveal any significant impact of sleep quality on the academic performance of the students. We also analyzed the most prevalent factors that were responsible for disruption of sleep in college goers and probed the major reasons for nighttime phone usage, which

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revealed social media to be a major contributor. Although the negative impact of sleep deprivation on academic performance has been studied earlier, any differential impact of stream has not been addressed thoroughly. Unlike the common belief of disparity induced due to stream-based academic pressure, our survey analysis showed insignificant contribution of stream leading to differences in sleep quality of students. Although participants' reported mild disruption in sleep, it was observed across all streams and it did not seem to have an immediate effect on overall sleep quality of undergraduate students.

Keywords: *Sleep, Sleep Quality, Undergraduate, Stream-Based Differences, PSQI*

Sleep is a complex and dynamic biological process that is prevalent in almost all biological entities. Sleep plays a pivotal role in cognitive and systemic physiological processes in the body, affecting how an organism functions [1]. While the scientific community is still trying to uncover the functional importance of sleep with respect to various physiological processes, the importance of a healthy sleep cycle is well accepted. Increasing research focus on sleep assessment and associated health implications in medical as well as psychological studies is evident from the volume of peer-reviewed sleep journals tripling in the last two decades [2]. In recent times, there is a growing interest in demystifying the interconnection between sleep deprivation and academic performance in young adults [3]. Two basic parameters that can be used to assess sleep quality of individuals are; objective and subjective parameters [4]. Objective sleep quality is a more scientific and practical approach that evaluates sleep parameters based on actigraph or polysomnography (PSG) measurements. Since the measurement of objective sleep qualities requires expensive equipments and is often time-consuming, most of the researchers and clinicians nowadays also rely upon subjective measures that are based on self-assessment using questionnaires or sleep diaries. Ideally, both objective and subjective measures should be used in the clinical assessment of sleep-related issues but the subjective sleep quality is shown to act as an added predictor variable when it comes to experimental studies [5].

The different questionnaires used for measuring sleep quality include Pittsburgh Sleep Quality Index (PSQI), Mini-Sleep Questionnaire (MSQ), SLEEP-50 Questionnaire, Athens Insomnia Scale (AIS), Insomnia Severity Index (ISI), Jenkins Sleep Scale (JSS), Leeds Sleep Evaluation Questionnaire (LSEQ), and Epworth Sleepiness Scale (ESS) [6]. Out of these, the 'gold standard' questionnaire used in sleep studies is the Pittsburgh Sleep Quality Index (PSQI), a self-rated questionnaire developed by Buysse and his colleagues from the University of Pittsburgh [7]. PSQI is a heterogeneous or multidimensional questionnaire that has application in clinical diagnostics. This questionnaire overcomes the limitations of all the previously developed sleep assessment tests. None of the earlier questionnaires gave a simple global score to compare the sleep qualities of different individuals, while on the other hand, PSQI score helps to categorize individuals as "good" and "poor" sleepers [7]. PSQI provides a valid and standardized measure of sleep quality. Even though the PSQI questionnaire does not provide an accurate clinical diagnosis of the sleep disorder, it does give clinicians a certain edge to determine areas that need further investigation.

The accuracy of a survey often depends on the response burden, interface, and comprehension of the survey questionnaire by the respondents. A lengthy questionnaire may lead to premature termination of answers, unwanted rush, loss of attention span, and ultimately increased chances of erroneous reporting [8]. In the present study, we have modified the PSQI questionnaire to scale down the participant response burden and fatigue

effect associated with a lengthy online survey. Similar shortening of the PSQI questionnaire in some previous studies have proved to be an acceptable alternative to the original PSQI questionnaire [9].

World Health Organization (WHO) defines adolescents and 'young adults' as individuals spanning age groups between 10 and 24 and most of the college-going undergraduate students fall under the category of young adults [10]. According to the World Population Prospects: 2015 Revision, India has the world's highest number of 10 to 24-year-olds, with 242 million young adults [11]. This 'youth bulge' is projected to last at least till the year 2025 by the United Nations Population Fund (UNFPA) [12]. A large proportion of these young adults are undergraduate students. According to the 2019-20 Union Education Ministries Report of All India Survey on Higher Education (AISHE), the Gross Enrolment Ratio (GER) or the percentage of students belonging to the eligible age group enrolled in Higher Education is 27.1% [13]. With such a high population of students enrolling for higher education in India, the competition is fierce and the associated uncertainties frequently add to stress in students' life [14]. College life is also a critical time as it marks a transition from high school to campus culture with different norms of discipline and independence, leading to increased vulnerabilities, such as picking up unhealthy habits of smoking and drinking. Sudden changes in lifestyle may lead to many sleep-related challenges, since the student has to cope with diverse responsibilities and choices [15]. If not addressed in time, these vulnerabilities frequently add to anxiety, making irregular sleep routine, a relatively common phenomenon in a students' life. Sleep deprivation in students occurs most commonly as chronic partial sleep deprivation, where a student obtains some, but not adequate quality sleep [16]. Data suggests that around 90% of university students have roommates and among them, around 41% stay awake at night due to disturbances [17]. Social media engagement also becomes more frequent and is often linked to negative outcomes [18].

Sleep deprivation is a societal epidemic that is largely ignored and considered one of the root causes of decreased productivity, accidents, and incidents [19]. Researchers at the National Institute of Health (NIH) have reported a correlation between short sleep length and decreased lifespan [20]. A previous study showed an assemblage of sleep complaints reported by college students indicating sleep disorders like insomnia, delayed sleep phase disorder (DSPD), restless legs syndrome (RLS), periodic limb movement disorder (PLMD), and obstructive sleep apnea (OSA), etc. which can also impact academic excellence [21, 22].

The purpose of this study is to determine the sleep quality in a sample population of undergraduate students in India belonging to different streams and to examine the prevalent habits associated with their sleep quality. We also explore the relationship between sleep quality and certain practices generally accepted as health risk factors for undergraduate students.

METHODOLOGY

Sample

The sample population comprised of 625 undergraduate students across India spanning a wide range of subject specializations and courses. The cross-sectional study was based on an anonymous online survey conducted in March 2020 using Google forms circulated via social media. The study builds upon non-probability-based sampling method or snowball sampling wherein the respondents were asked to assist the researcher to carry forward the

questionnaire by sharing it further, building up data as it progressed. The survey questionnaire consisted of a total of 16 questions in multiple-choice, checkbox, and short answer type format designed to furnish information about the archetypal sleep behavior of undergraduate students and various subjective variables affecting sleep qualitatively as well as quantitatively. The survey was composed of two parts- Part A which assessed sleep quality with the help of standardized PSQI- a self-rated questionnaire and Part B, a multidimensional assessment of sleep habits. Response bias was reduced while framing the questionnaire by scrutinizing the questions and processing errors were minimized by analyzing the data thoroughly. The anonymity of the respondents has been kept resolute throughout this study. No incentives were offered for responding to the survey (Supplementary S1a).

Instruments

1. **Pittsburgh Sleep Quality Index (PSQI):** The Pittsburgh Sleep Quality Index (PSQI) is a widely accepted questionnaire that helps us to assess sleep quality and disturbances over a one – month time interval [7]. It is an important health assessment tool in both clinical and non-clinical setups. The Index deals with questions ranging from average duration of sleep at night, the difficulties experienced in falling asleep and other sleep disturbances.
2. **Kruskal-Wallis H test:** also called the "one-way ANOVA on ranks" is a rank-based nonparametric test which is often used to determine if there are any statistically significant differences between two or more groups of an independent variable on a continuous or ordinal dependent variable [23]. The test was performed using Statistical Package for the Social Sciences (SPSS) which is a software package with a rich set of tools for interactive statistical analysis [24].
3. **Datawrapper:** Datawrapper is a free open-source online tool developed by Datawrapper GmbH with which interactive plots, charts and tables can be created [25]. The plots in this study have been created using this tool and further analysis was carried out by Microsoft Excel 2007.

Procedure

The actual questionnaire of PSQI consists of total 19 self-rated questions and 5 questions rated by the bed partner, if present. The latter five questions do not contribute to the PSQI scoring. This gives information about seven different components of sleep which are routinely used in clinical studies.

Seven different components of PSQI being:
Component 1 – Subjective Sleep Quality, **Component 2** – Sleep Latency, **Component 3** - Sleep Duration, **Component 4** – Habitual Sleep Efficiency, **Component 5** – Sleep Disturbances, **Component 6** – Use of Sleeping Medication, and **Component 7**- Daytime Dysfunction.

In order to reduce the time and burden of questions, the method of indexing employed in this study was a slightly modified version of the actual PSQI questionnaire. In place of standard 19 questions, the number of questions used for PSQI scoring was scaled down to 8 covering the quintessential information necessary to grade each component of PSQI index.

The scoring of all the components are carried out on a 0-3 point scale with a score of “0” indicating absolutely no difficulty, while a score of “3” indicating severe difficulties in

specific sleep-related issues. The cumulative score of all seven components are added to yield one '**Global'** score, with a range of 0-21 points wherein "0" indicating the best sleep quality and "21" indicating the worst sleep quality (Supplementary S1b).

Scoring proceeds as follows:

Component 1: Subjective sleep quality

Response	Score
Very Good	0
Fairly Good	1
Fairly Bad	2
Very Bad	3

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Component 2: Sleep Latency

Response	Score
Less than or equal to 15 minutes	0
16-30 minutes	1
31-60 minutes	2
>60 minutes	3

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Component 3: Sleep Duration

Response	Score
>7 hours	0
6-7 hours	1
5-6 hours	2
<5 hours	3

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Component 4: Habitual sleep efficiency

1. Write the number of hours slept (from component 3): _____
2. Calculate the no. of hours spent in bed:

Getting up time: _____

Bedtime: _____

3. Calculate the habitual sleep efficiency as follows:

(Number of hours slept/Number of hours spent in bed) *100 = Habitual sleep efficiency (%)

4. Assign the score for **component 4** as follows:

Component 4: Habitual sleep efficiency

Response	Score
>85%	0
75-84%	1
65-74%	2
<65%	3

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Component 5: Sleep Disturbances

Responses	Score
Not during the past month	0
Less than once a week	1
Once or twice a week	2
Three or more times a week	3

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Component 6: Use of Sleeping Medication

Responses	Score
Never Taken	0
Not during the past month	0
Less than one a week	1
Once or twice a week	2
Three or more times a week	3

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Component 7: Daytime Dysfunction

Responses	Score
No problem at all	0
Only a very slight problem	1
Somewhat of a problem	2
A very big problem	3

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RESULTS

The study was analyzed in three sections as follows:

Section A

This section deals with the subjective assessment of sleep and the variables affecting it. The key highlights and results of the subjective sleep quality are presented in this section in the form of plots and tables along with the demographic disposition of the data.

Section B

Consists of questions that helped assess and delineate several factors that are directly or indirectly related with subjective sleep quality. These included impact on cognitive performance, disturbances in sleep schedule, and phone usage to name a few. The self-reported data provided information on sleep duration, academic performance based on cumulative grade point average (CGPA), and sleep disturbances along with conscious subjective expressions such as feeling after waking up.

Section C

This section contains multifaceted statistical analysis of the data collected from the self-reported questionnaire and investigates the association between the Global PSQI score and stream of undergraduate students.

SECTION A

The key highlights of this section are the demographic disposition of the data and the graphical representation of the scores of PSQI components that helps to assess the subjective sleep quality of the participants.

1a) 1b)

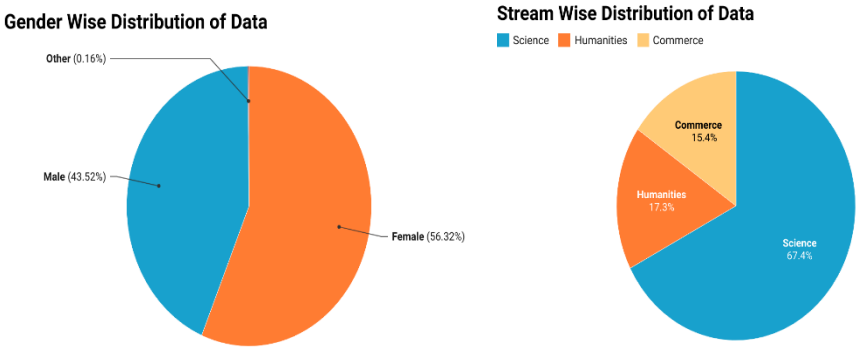


Fig.1: Distribution of undergraduate students based on 1a) gender and 1b) stream

The present study comprised of a total of 625 participants, of which 352 were females and 272 were males and 1 from the other category. These students belonged to different streams (421- science, 108–humanities, and 96-commerce).

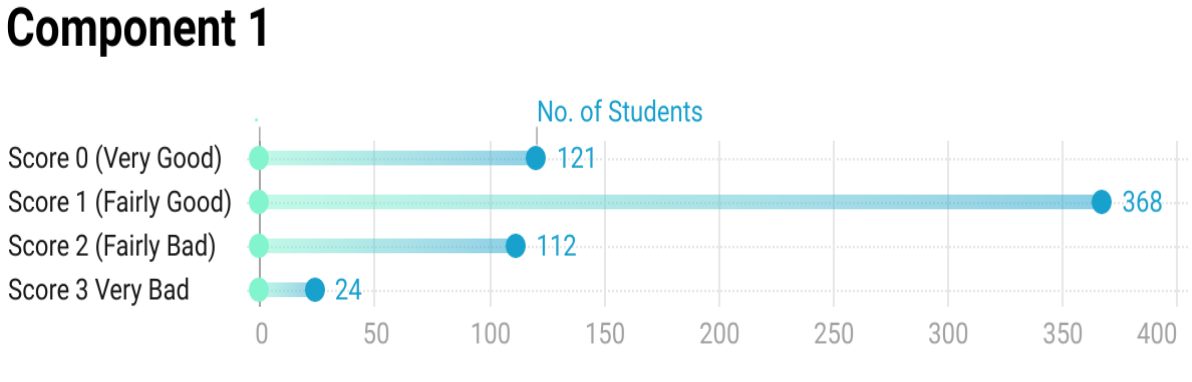


Fig. 2: Plot showing distribution of students according to their subjective sleep quality scores (Component 1)

Based on the scoring matrix defined by PSQI questionnaire, the subjective sleep quality scores were calculated for all the participants (Figure 2). The subjective sleep quality is based on the feeling of the respondents in contrast to the objective sleep quality that is more factual in nature. It is arduous to calculate the actual sleep quality as most often than not, the sleep quality is not directly associated with the sleep duration and rather depends on complex interrelation between multiple factors. The lesser the score, greater is the subjective depth, efficiency and quality of sleep pertaining to 'good sleepers' [5]. In our dataset, 368 participants showed a substantial score of 1(fairly good) followed by 121 with a score of 0(very good). 112 students scored 2 (fairly bad) while 24 students had a score of 3 (very bad). Good sleep quality has been loosely associated with various beneficial outcomes such as better psychological functioning, lower day time fatigue and greater overall well-being while poor sleep quality correlated with increased physical as well as psychological distress [26].

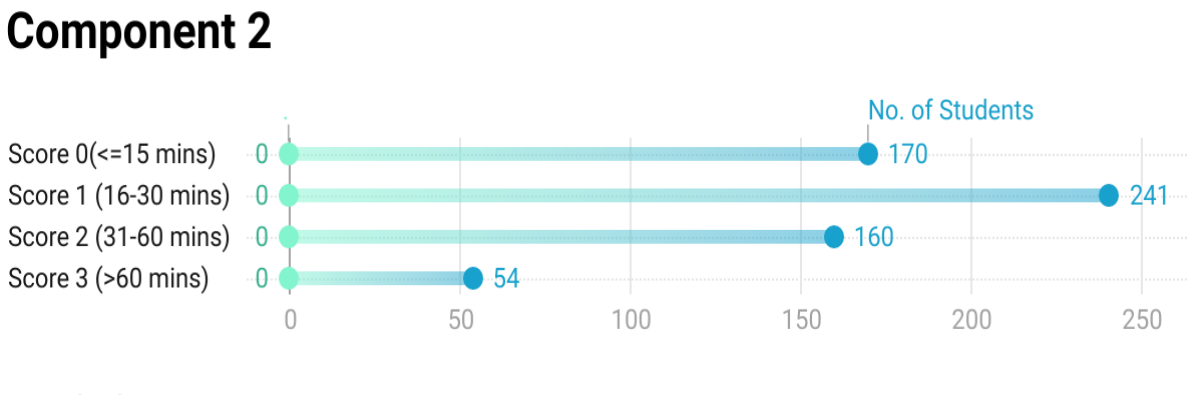


Fig.3: Plot showing distribution of students according to sleep latency scores (Component 2)

Next, we calculated the sleep latency or sleep onset latency (SOL) in students which can be defined as the time taken to shift from a state of being fully awake to sleep. The ideal period of this transition should be brief. The time taken by an individual to complete this transition or the sleep latency directly relates with sleep efficiency (component 4 of PSQI). Normal young adults have a mean sleep latency range between 10-20 minutes which gets severely distorted in case of sleeping disorders. It was seen that the majority of students fall in the moderate range (241) or show a low sleep latent time. A comparatively low number of students (54) showed a high sleep latency period and took longer than 60 minutes to fall asleep, as shown in Figure 3.

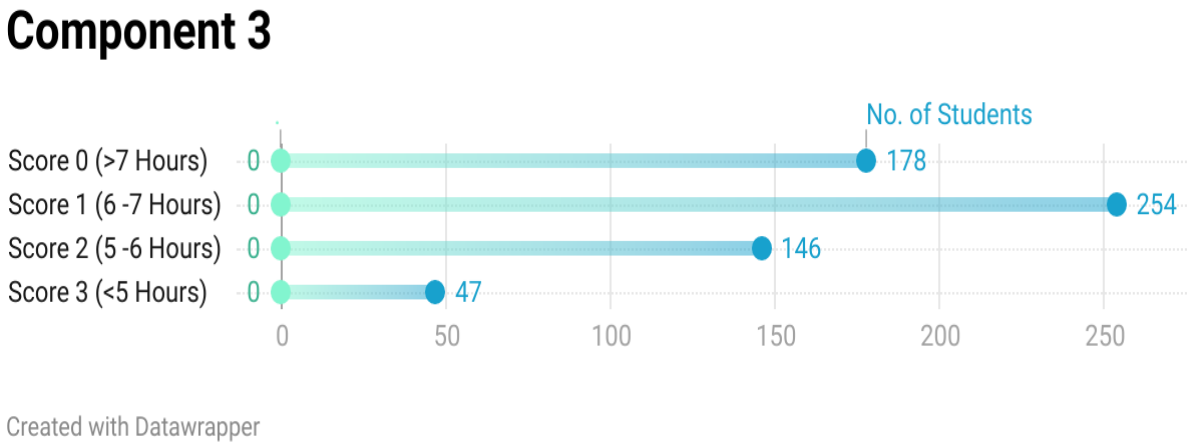


Fig. 4: Plot showing distribution of students according to duration of sleep (Component 3)

The duration of sleep in a 24-hour day-night cycle is suggested to govern almost all aspects of the human body including metabolism, mood, and physical and mental health [27]. Inadequate sleep duration directly affects the above-mentioned processes and most notably the functions of the brain critical to cognitive processes such as memory, reasoning, and creative thinking, which plays a crucial role in an undergraduate student's daily life [28]. The National Sleep Foundation recommends 7-9 hours of sleep per night for young adults in the age group of 18-25 years [29]. Our data showed a higher proportion of students with a normal sleep duration cycle of 6-7 hours or more than 7 hours. A small number of students (47) showed poor sleep duration of less than 5 hours (Figure 4).

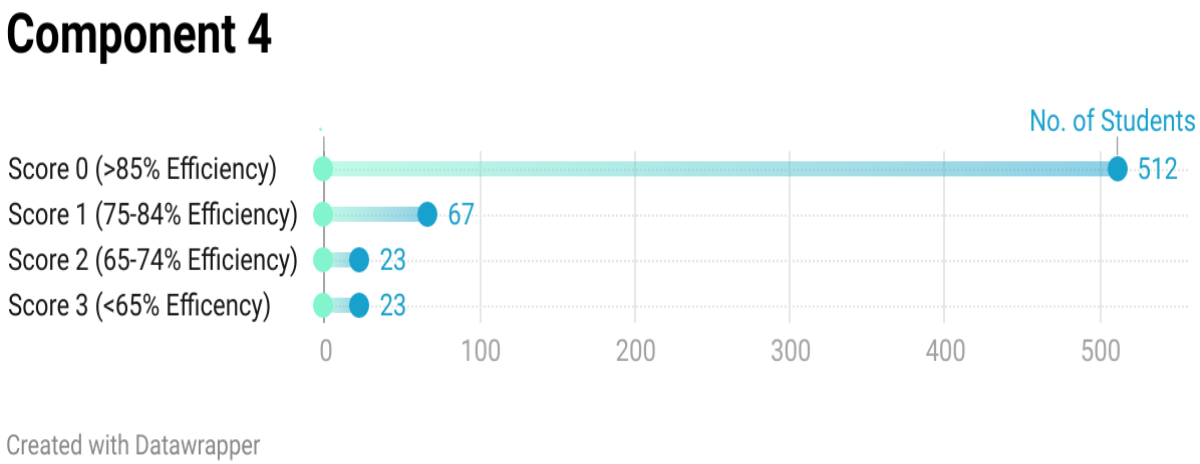


Fig.5: Plot showing distribution of students according to habitual sleep efficiency scores (Component 4)

The habitual sleep efficiency was calculated using the formula given in methodology section and thereafter sorted into four categories, more than 85%, 75-84%, 65-74%, and less than 65%. Sleep efficiency of more than 85% indicates good efficiency and less than 65 % shows poor efficiency. The efficiency is directly related to the sleep latency as higher the time a person spends in bed trying to fall asleep, lower is his or her sleep efficiency. The study recorded that most of the students (512) had a good sleep efficiency of more than 85%. Around 11% of them had a sleep efficiency of 75-84%. An equal number of the students had sleep efficiency between 65-74%, and less than 65% (23 each) (Figure 5).

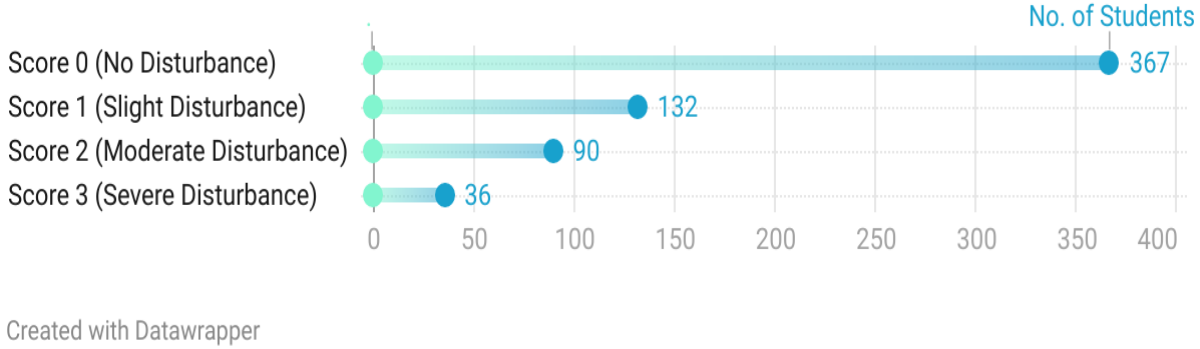


Fig. 6: Plot showing distribution of students according to sleep disturbances (Component 5)

Factors for sleep disturbances can be typically classified into internal disturbances such as obstructive sleep apnea, upper airway resistance syndrome, frequent urination etc. and external disturbances owing to factors such as ambience, light, and bed partner. Nonetheless, both types of disturbances affect the overall sleep quality of an individual. In our study, around 370 students did not report any sleep disturbance while 132 students said they experienced slight problems. On the other hand, about 40 students were severely affected by sleep disturbances (Figure 6).

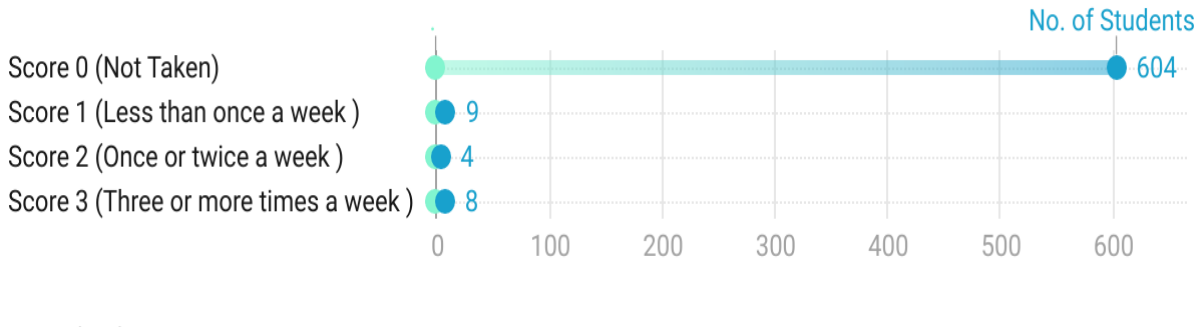


Fig. 7: Plot showing distribution of students according to frequency of medication usage to induce sleep (Component 6)

Insomnia can be either experienced transiently or be present as a chronic health condition. The use of medication to induce sleep becomes necessary when an individual faces frequent sleeping difficulty due to various conditions exacerbated by morbidity, lifestyle changes or depression. Therapeutic medications or over-the-counter sleeping pills are often indiscriminately used in India to treat sleeplessness [30]. It is evident from the plot that the majority of students in our study don't use any medicines to effectuate sleep (Figure 7).

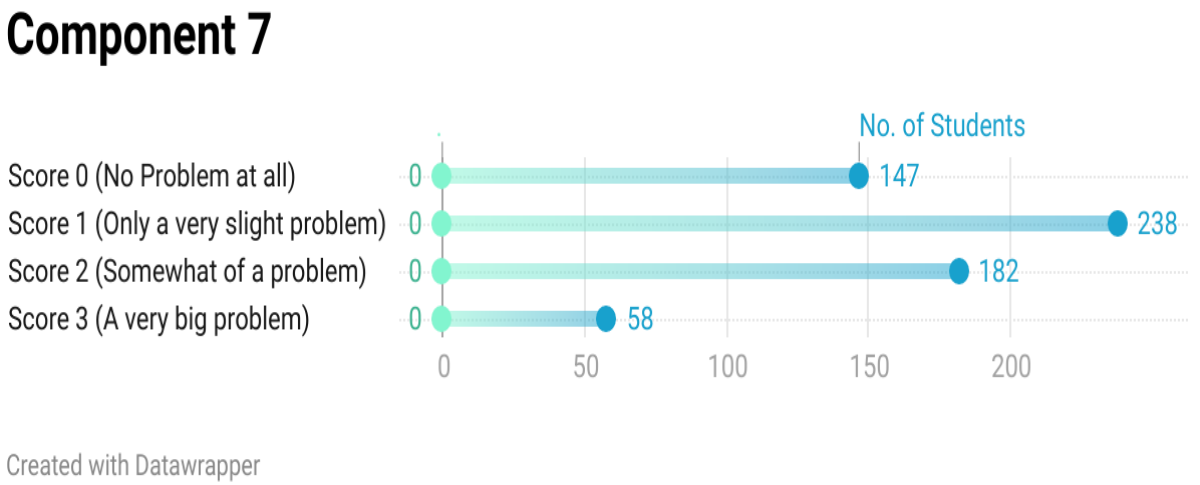


Fig. 8: Plot showing distribution of students according to daytime dysfunction scores (Component 7)

Daytime dysfunction can be defined as the lack of enthusiasm to carry out daily activities and having trouble staying awake during the day. The study data indicates that the majority of participants experienced minimal problem in their daytime functioning, with 238 students with a score of 1 and 147 students with a score of 0. However, 58 students had a score of 3, indicating they face severe daytime dysfunction.

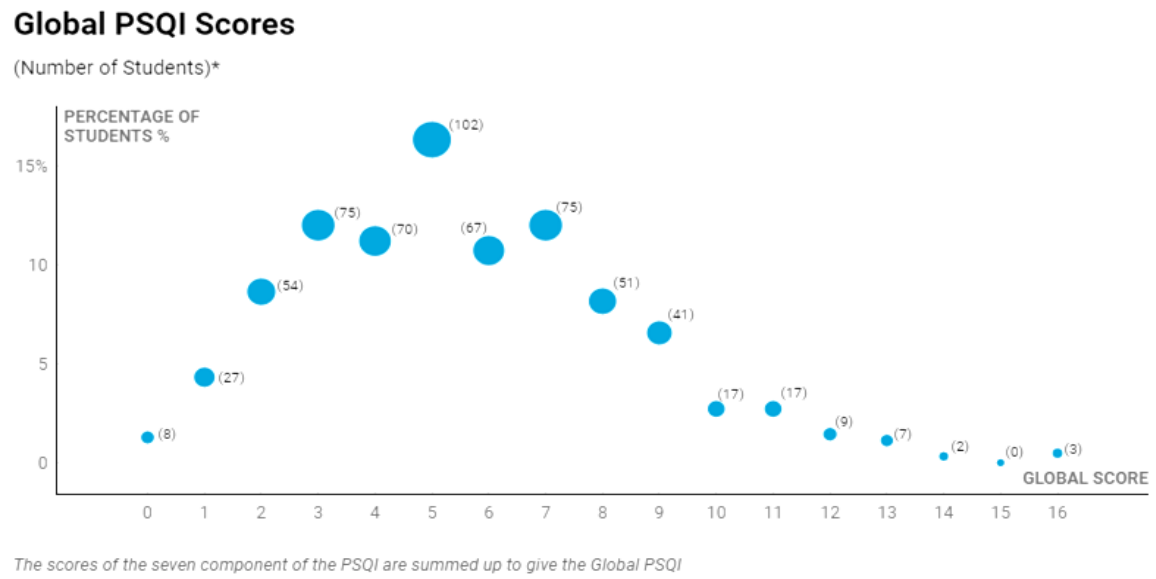
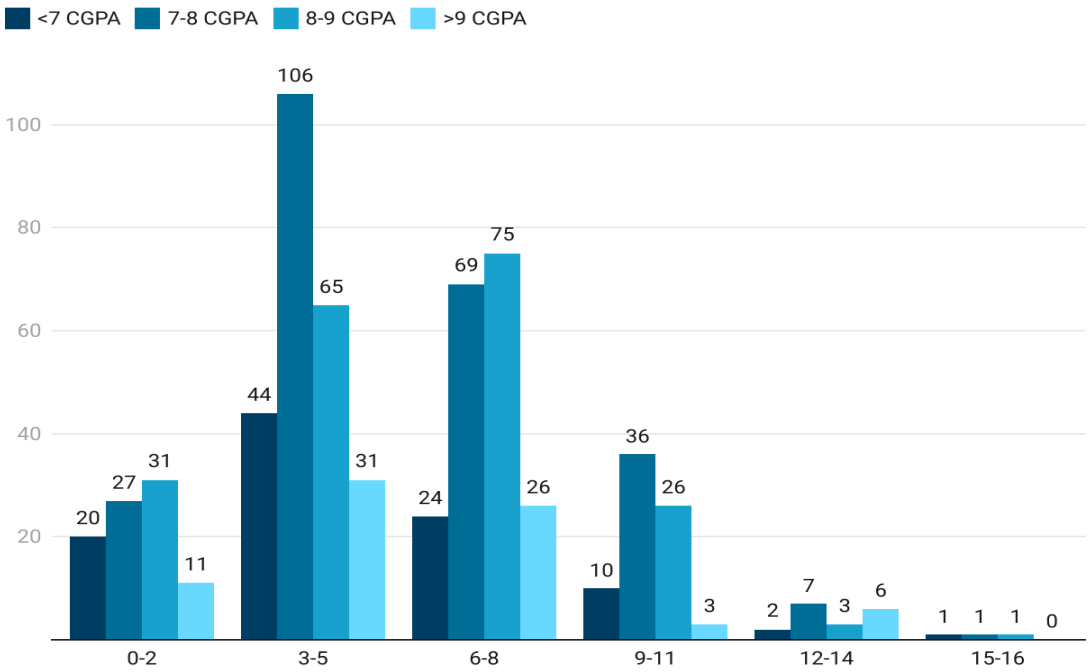


Fig. 9: Scatter plot showing distribution of Global PSQI scores

Further, the scores of the seven components were summed up to obtain a global score for each participant, with a possible range of 0-21, with "0" indicating no sleeping difficulty and "21" indicating severe difficulty. The overall sleep quality of an individual is estimated from analyzing various parameters such as sleep initiation, number of awakenings, ease of sleep onset and the duration of sleep. In our dataset, the Global PSQI scores obtained by participants ranged from 0 to 16. Overall, 93.92% of the students had global scores of less than 10, which signifies moderately good quality of sleep. Out of these students, 53.76% had score of 5 and below, which indicates that they are healthy sleepers. 6.08% of students had score of more than 10, which suggests that they are experiencing difficulty in sleeping and may be suffering from sleep related disorders.

10a)



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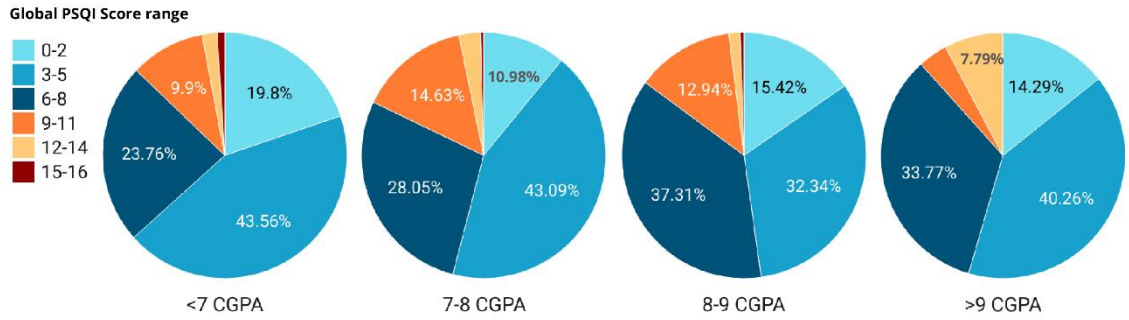

Fig. 10: ***Plot showing relationship between CGPA and Global PSQI scores of undergraduate students. a) Representation of the relationship as bar graph with student strength in numbers (y-axis) shown for different PSQI score categories. The distribution of students based on the CGPA groups is color coded, as shown in the key. b) Representation of the relationship as individual pie charts for each CGPA group showing distribution of students in percentages belonging to different PSQI score categories.***

Next, we aimed to evaluate the presence of any relationship between the sleep quality (calculated through Global PSQI score) and the academic performance of the undergraduate students (reflected through CGPA score) (Figure 10). Since the majority of students in our dataset had a global score range of 3-5 (good sleepers) (Figure 10a), we converted the data into percentages to avoid any bias. Among the group (CGPA 7-8), 43.09% students had a global score range of 3-5. However, this distribution was also reflected among the other groups, with higher/lower CGPA ranges. In fact, students with a Global PSQI score of 6-8 had maximum percentage of students falling into the good academic score range of 7-9. As shown in Figure 10b, the students with >9 CGPA, had a mixed distribution of excellent to moderately good PSQI scorers. Although poor PSQI sleep scorers are completely missing in this category, due to limited students in the said category, no clear conclusion could be drawn. Overall, this indicates that in the present dataset, moderate variation in sleep quality in general is not affecting the academic performance of the students. However, we cannot fully ascertain the impact of sleep efficiency on other personal and professional aspects of a students' life since the present questionnaire failed to capture these aspects in quantitative terms.

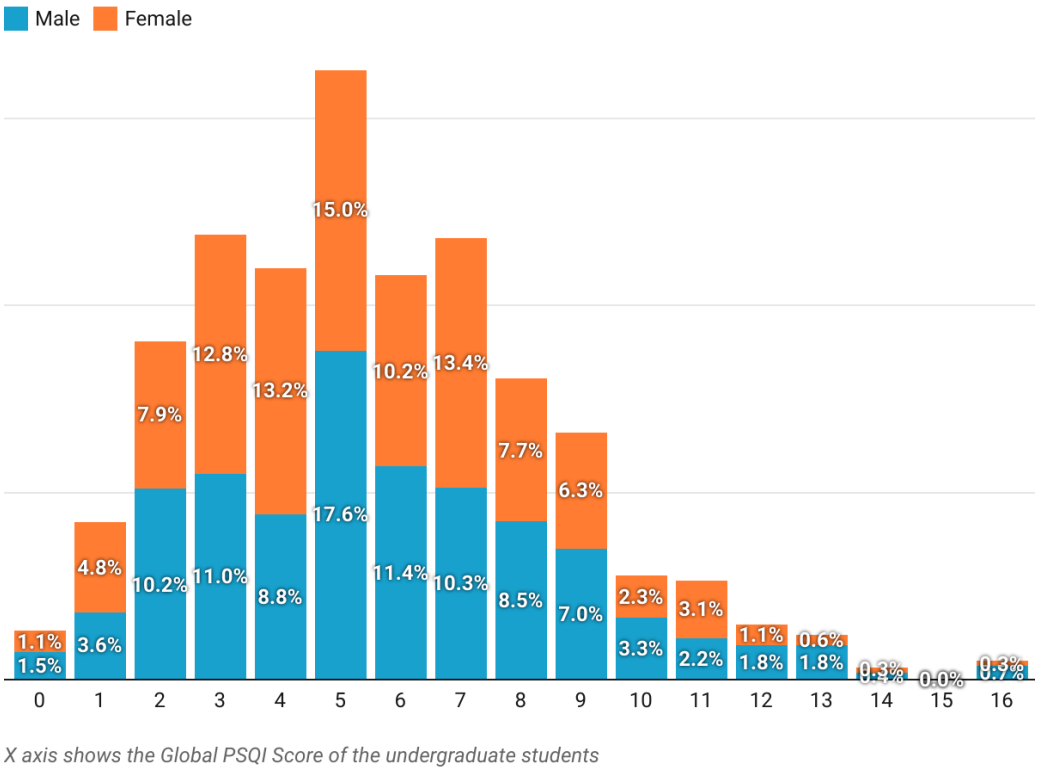

Fig. 11: Plot showing relationship between Gender and Global PSQI scores of undergraduate students

Our dataset did not show any difference in sleep quality based on gender of the participants (Figure 11).

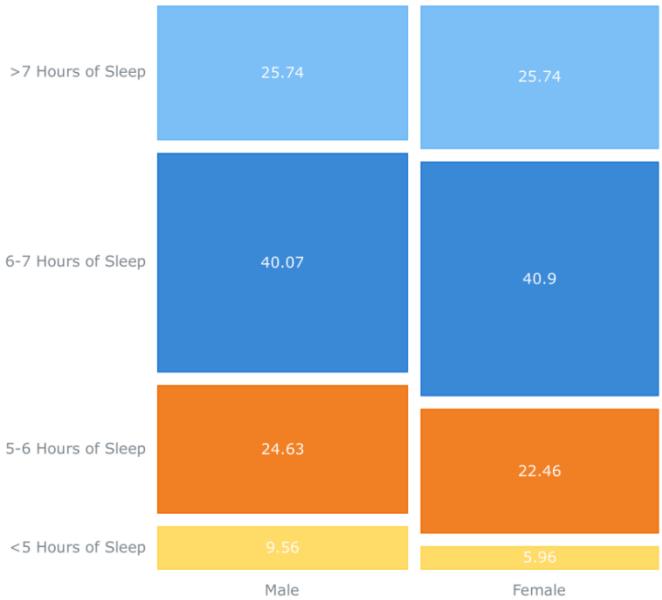

Fig. 12: Mosaic plot between gender and duration of sleep of undergraduate students

The mosaic plot in Figure 12 showed that the majority of the students have sleep duration of more than 6 hours, irrespective of their gender. Male students are slightly more sleep deprived as compared to the female students (9.56% v/s 5.96% sleep for less than 5 hours).

SECTION B

This section contains all the additional factors that helped assess the subjective sleep quality and deduce various correlations by analyzing data provided by the students.

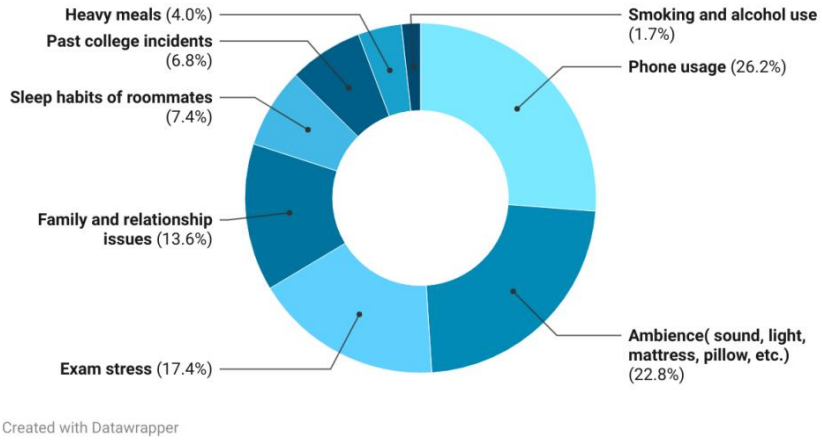

Fig. 13: Doughnut plot showing distribution of various factors disrupting sleep in undergraduate students

As evident from Figure 13, phone usage (26.2%) and sleeping ambience (22.8%) are the two major factors that affected the sleep of participants. In addition, exam stress and relationship issues also seem to contribute in impacting sleep. Most of the participants did not feel that past college incidents, heavy meals or usage of cigarettes and alcohol play a significant role in disturbing their sleep pattern.

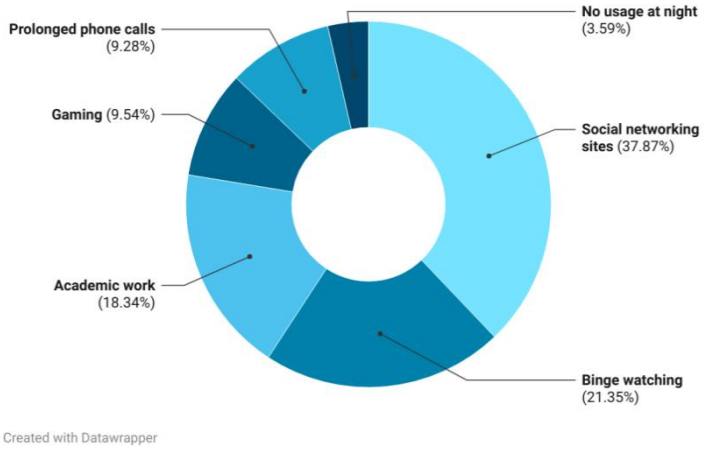

Fig. 14: Doughnut plot showing distribution of major reasons for night-time phone usage in undergraduate students

Since phone usage is considered to be one of the prime factors affecting sleep nowadays, we asked the participants about their night-time phone usage pattern. It is evident from the data that social networking sites contribute a lion's share in phone usage (37.87%). Second major reason was binge watching on OTT platforms, which shows that social media and OTT platforms have a major impact on the lifestyle of many undergraduate students. Some students (18.34%) used phone for academic work at night, while a small number of students

used it for prolonged phone calls (9.28%) and gaming (9.54%), respectively. Only a meager 3.59% of students did not use phone at night for any activity.

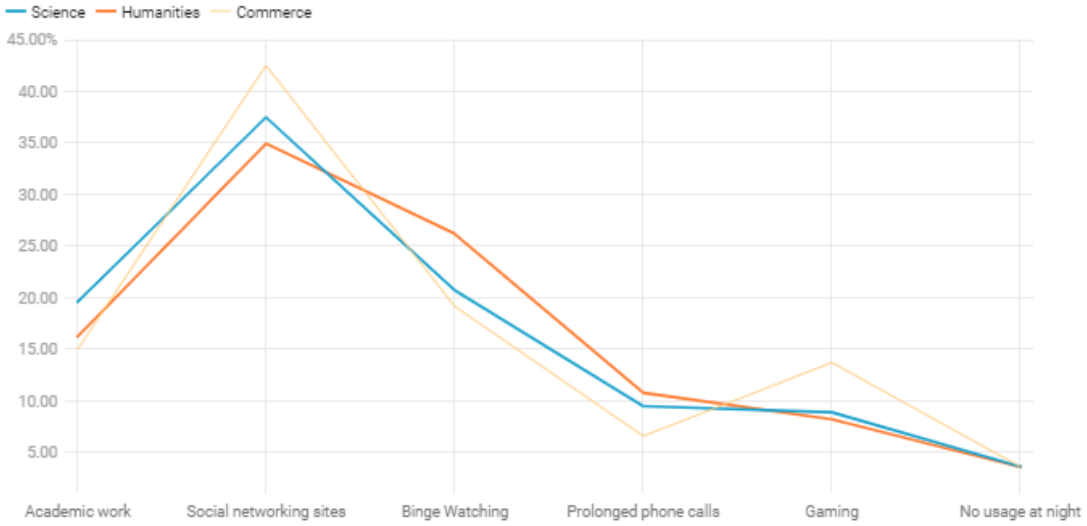

Fig. 15: Line graph showing stream-wise distribution of night-time mobile usage pattern in undergraduate students

Upon demarcating the undergraduate students based on their stream (humanities, commerce or science), the data did not reflect any major changes in the phone usage pattern. The highest percentage of students from all the 3 streams use their phone for social networking sites with 34.94%, 37.5%, and 42.51% for humanities, science, and commerce respectively. A higher fraction of science students use it for academic work (19.6%) while a higher portion of humanities students use it for binge watching (26.2%). More number of commerce students use their phones for gaming (13.71%).

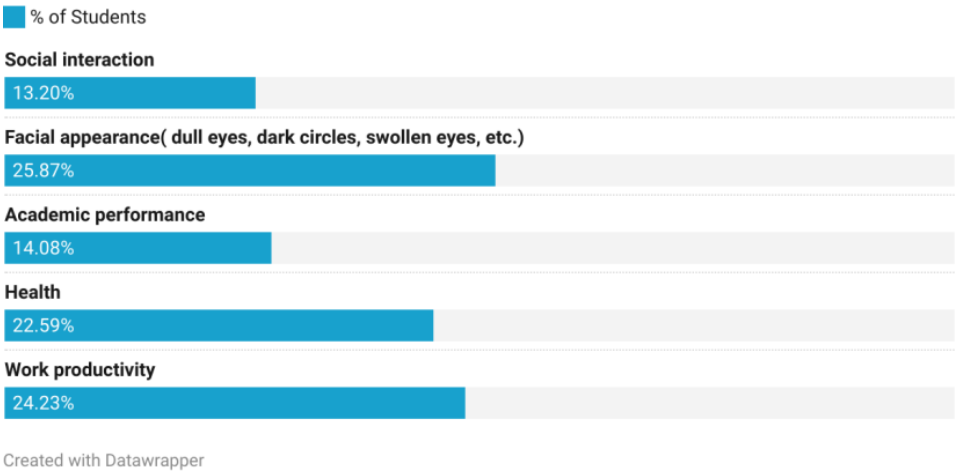

Fig. 16: Graph showing distribution of various effects of insufficient sleep on undergraduate students

The highest percentage of students (25.87%) felt that insufficient sleep leaves an impact on their facial appearance, namely dull eyes, dark circles etc. The second major impact of sleep falls on their work productivity (24.23%) followed by health (22.59%). Various clinical surveys also have shown in the past that insufficient sleep does impact health and

appearance adversely [31, 32]. A relatively lower percentage of students considered that sleep affects their academic performance (14.08%) or their ability to socially interact with others (13.20%).

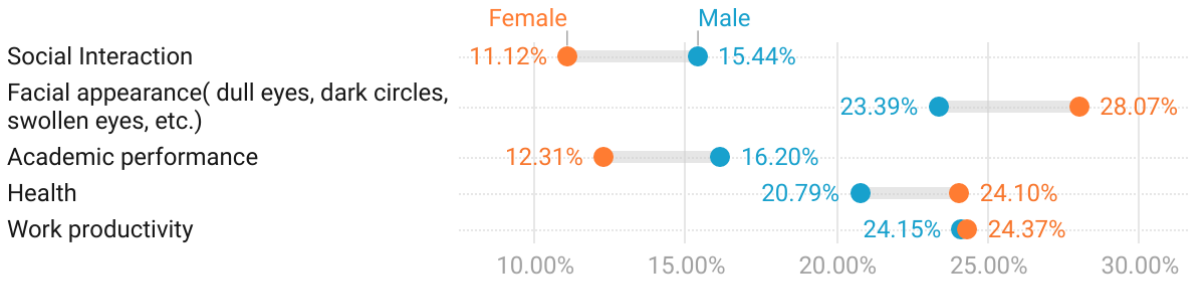

Fig. 17: Plot showing gender wise distribution of various effects of insufficient sleep on undergraduate students

Here again, there was no significant gender-based difference in the effects felt by students due to insufficient sleep, with the majority choosing impact on facial appearance as a major effect. The other factors also tend to be shared by both the genders, although the trend may vary slightly for different factors.

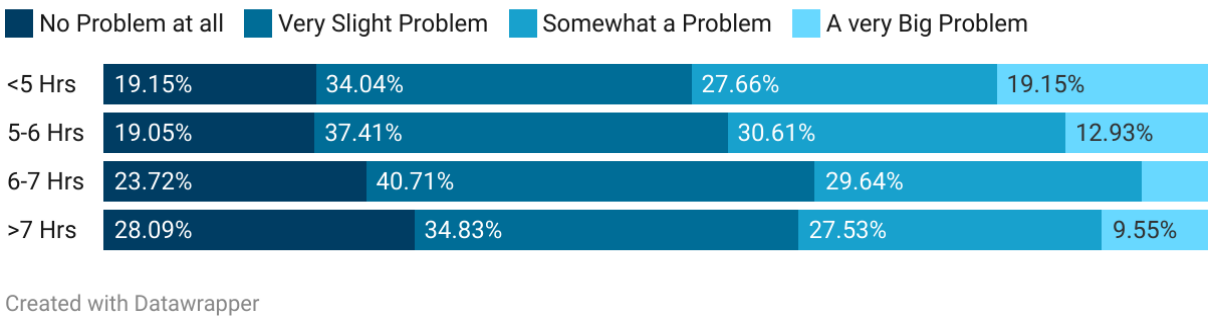

Fig. 18: Plot showing hours of sleep at night vs. enthusiasm

We also asked the participants to judge their overall enthusiasm for daily chores based on the hours of sleep the student gets at night. Here, the data revealed that when students slept for less than 5 hours in a day they were least enthusiastic about their daily chores. Majority of the students felt that on getting more than 7 hours of sleep, they faced minimal issues in carrying out their daily work. So the data responses generally concurred with the idea that students getting sufficient sleep showed better enthusiasm in their day-to-day chores, which is very important for a student to excel.

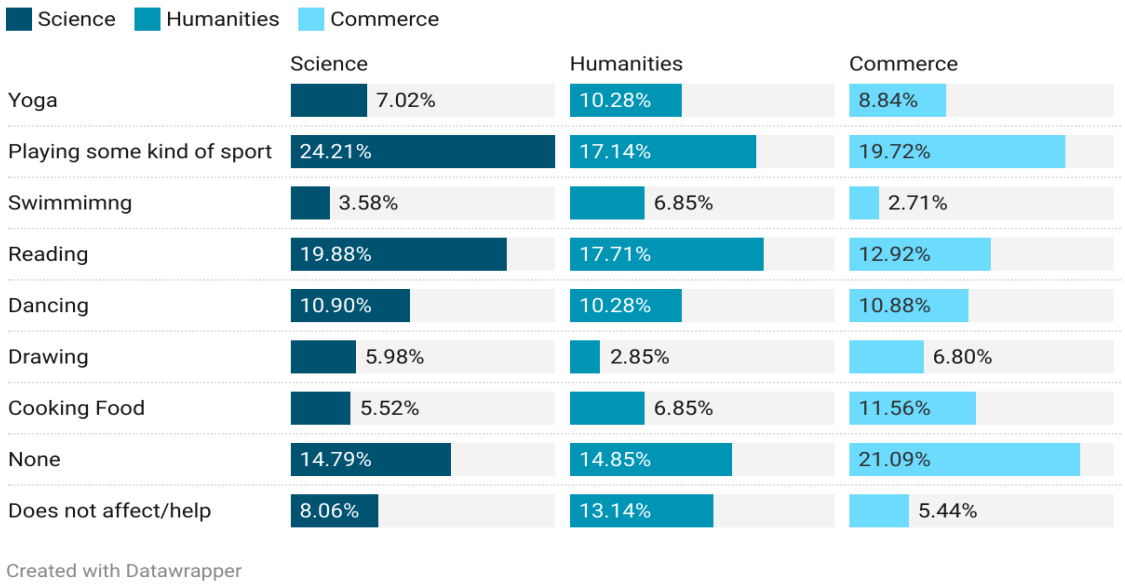

Fig. 19: Plot showing stream wise distribution of activities that helped students get sound sleep

The present data set showed that majority of the students, from all three streams, were engaged in playing some kind of sport, which they felt facilitated in getting a sound sleep. This activity was followed by reading, which was also shared among the students from all streams. Among the other activities, which contributed to getting better sleep, were dancing, yoga, swimming and cooking food. Surprisingly, many of the students, irrespective of the stream, were either not engaged in any of the activities or did not feel any of the mentioned activities affects their sleep quality. However, the general consensus seemed that some form of physical/mental activity facilitated in gaining sound sleep.

SECTION C

The section deals with the examination of cross-classified category data with Kruskal-Wallis H test for answering questions about the association or the lack of it between sleep and demographic variables.

Hypothesis

H_0: The null hypothesis is that the distribution of Global PSQI score is the same across categories of stream of undergraduate students.

Table 1: Descriptive statistics of Global PSQI score and stream of undergraduate students

	PSQI		
	Commerce	**Humanities**	**Science**
Valid	96	108	421
Missing	0	0	0
Mean	5.563	5.500	5.603
Std. Deviation	2.937	2.702	2.932
Minimum	0	1	0
Maximum	14	12	16

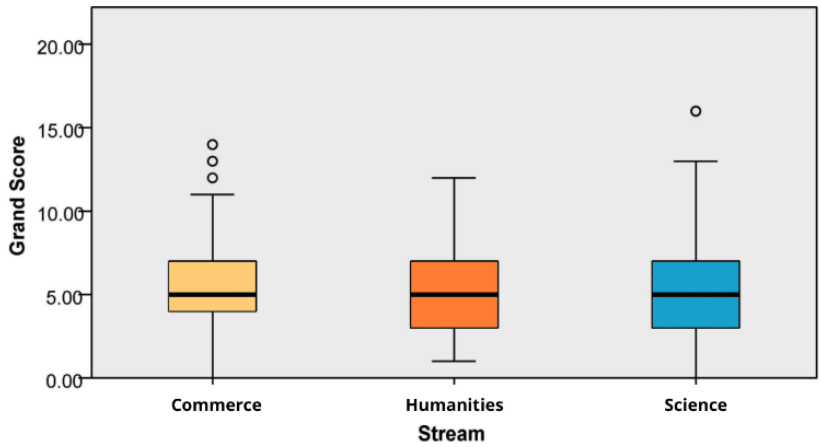

Fig. 20: Box plot showing the median of Global PSQI grand scores of students belonging to different streams

Table 2a: Hypothesis Test Summary for Independent Sample Kruskal-Wallis H test statistics between stream and Global PSQI scores of undergraduate students

Null Hypothesis	Test	Sig.	Decision
The Distribution of Grand Scores is the same across categories of Stream	Independent-Samples Kruskal-Wallis Test	0.930	Retain the Null Hypothesis

Asymptotic significances was displayed. The significance level is .05

Table 2b: Independent Samples Kruskal-Wallis H test statistics between stream and Global PSQI scores of undergraduate students

Total (N)	625
Test Statistic	0.146
Degree of Freedom (df)	2
Asymptotic Sig. (2-sided test)	0.930

1. The test statistic is adjusted for ties. 2. Multiple comparisons are not performed because the overall test does not show significant differences across samples.

The data in Table 1a shows that irrespective of the stream, most students fall under the category of good sleepers with a mean Global PSQI score of about 5. Upon considering the mean values, it is evident that the mean ranks of all three streams were similar and the undergraduate students showed almost similar sleep score regardless of their streams. Global PSQI score: science (M=5.603, SD= 2.932), commerce (M=5.563, SD= 2.937), and humanities (M=5.500, SD= 2.702).

As the data was not normally distributed, a non-parametric Kruskal-Wallis H test was conducted (Table 1b, 1c) using SPSS that gave a p-value of 0.930 which was found to be

more than 0.05, showing insignificant relation between stream and Global PSQI score. Thus, based on the data from our study, we fail to reject the null hypothesis (H_0). In other words, stream choice does not have an effect on sleep quality; as opposed to the general belief in India that science students have more academic workload, which impact their sleep quality.

DISCUSSION

The analysis of Global PSQI score based on the seven components of sleep assessment questionnaire revealed that the majority of participants had fairly good sleep quality, with an average duration of sleep ranging from 6-7 hours (Fig. 5).While the general public perception is that academic burden at undergraduate level leads to compromise on sleep, the results revealed an overall balance among students. This pattern comes as a stark contrast from a previous study where undergraduate students reported to have bad sleep quality [33]. Students felt impact on health and functioning upon fluctuations in sleep cycle but however this was not a regular feature among students included in this dataset.

In our study, the academic performance was measured in terms of the CGPA scored by the student which is a standard grading system employed to evaluate students by most educational institutions [34]. Sleep deficit, sometimes also known as social jetlag, is often linked with decreased work productivity, crumbling social interactions, lack of concentration and attention during classes, which may hamper the learning process and possibly their grades [35]. Studies have suggested that sleep deficiency affects the prefrontal cortex (PFC) of the brain that controls cognitive functions such as analytical skills, creativity, planning, decision making, and certain aspects of language. This was also stressed upon in the 'prefrontal vulnerability hypothesis' proposed by Horne which states that cognitive abilities are impaired because of prolonged wakefulness [36]. Since the majority of students in the current dataset scored fairly good CGPA (7-9), and also scored well in the PSQI sleep quality index (3-5), this served as a positive indicator. However, due to insufficient numbers of poor sleepers, any concrete conclusion could not be drawn regarding the relation of sleep quality and academic performance (Fig. 10). We also explored the use of medications to induce sleep and found it to be significantly negligible in our data set which again comes as a positive note.

Our results did indicate a relationship between the duration of sleep and the level of enthusiasm felt by students for daily chores (Fig. 18) in addition to the adverse impact felt by participants on their facial appearance, health and overall work productivity. This suggests that like previous reports, better sleep quality and duration does correlate with better focus and well-being [37], but since the sleep pattern was overall balanced in the current dataset, minimal adverse effects in terms of effect on academic performance was seen. It is also to be noted that CGPA grading system, albeit most emphasized in University education system, is only a partial indicator of students' overall performance and growth, and perhaps evaluating other indicators through detailed questionnaires may highlight varying trends.

A previous study suggested sex-specific sleep pattern in young adults, with females getting better quality sleep than males [38]. In the current study, no significant difference was observed between sleep quality of male and female students. On an average, males are on par with females with the latter displaying a slightly better sleep duration (Fig. 12). The survey received only a single response in the 'other' category, who exhibited moderate to bad sleep quality and hence was non-conclusive. In India, there is a long-standing perception

bias on students belonging to different academic streams, with a notion that the science students in undergraduate courses have more academic load, which affects their sleep pattern. The statistical analysis in our study revealed no such impact of choice of stream on duration of sleep or quality (Table 2a, 2b). Every stream has its own set of challenges and the coping mechanism to situations may vary from student to student irrespective of the stream. Since most of the participants of this study had an overall balanced sleep pattern, and also fell into the academic category of good performers, the current dataset reflected a positive sleep trend. Additional studies with larger sample size can help verify or bring forth varying trends to represent the sleep patterns prevalent among undergraduate students.

CONCLUSION & LIMITATIONS

The key finding of the present study was that the stream choices of undergraduate students do not seem to influence the quality of sleep, an aspect relatively unexplored till now. These results seem to be in contrast with the stream bias associated with the Indian education system; however, no study has quantitatively probed into this facet. Nonetheless, more elaborate studies need to be planned to understand the differential burden of stream, beyond the scope of our study. In contrast to previous studies, the present dataset revealed that the majority of undergraduate students displayed an overall good sleep quality score and had fairly decent CGPA, irrespective of their sleep score. However, we cannot emphatically establish the relation between sleep quality and academic performance, since a large majority of students had a balanced sleeping pattern. Nonetheless, participants reported impact of sleep duration on their facial appearance and overall health. Since the study was based upon only undergraduate students, we cannot ascertain sleep patterns of students in other age groups. Further studies in this direction may prove useful to understand the impact of sleep pattern on other aspects of a student's life beyond academic performance.

REFERENCES

[1] Medic, G., Wille, M., & Hemels, M. E. (2017). Short- and long-term health consequences of sleep disruption. Nature and science of sleep, 9, 151–161. https://doi.org/10.2147/NSS.S134864.

[2] Worley S. L. (2018). The Extraordinary Importance of Sleep: The Detrimental Effects of Inadequate Sleep on Health and Public Safety Drive an Explosion of Sleep Research. P & T: a peer-reviewed journal for formulary management, 43(12), 758–763.

[3] Gaultney, J. F. (2010). The prevalence of sleep disorders in college students: impact on academic performance. Journal of American College Health, 59(2), 91-97. + Dmitrievna, M. S. (2021). Influence Of Quality And Quantity Of Sleep On The Academic Achievement Of Students. Бизнес-образование в экономикезнаний, (1 (18)).

[4] O'Donnell, D., Silva, E. J., Münch, M., Ronda, J. M., Wang, W., & Duffy, J. F. (2009). Comparison of subjective and objective assessments of sleep in healthy older subjects without sleep complaints. Journal of sleep research, 18(2), 254–263. https://doi.org/10.1111/j.1365-2869.2008.00719.x

[5] Zavecz, Z., Nagy, T., Galkó, A., Nemeth, D., &Janacsek, K. (2020). The relationship between subjective sleep quality and cognitive performance in healthy young adults: Evidence from Three empirical studies. Scientific Reports,10(1). doi:10.1038/s41598-020-61627-6.

[6] Ibáñez, V., Silva, J., & Cauli, O. (2018). A survey on sleep assessment methods. PeerJ, 6, e4849. https://doi.org/10.7717/peerj.4849.

[7] Buysse,D.J., Reynolds,C.F., Monk,T.H., Berman,S.R., & Kupfer,D.J. (1989). The Pittsburgh Sleep Quality Index (PSQI): A new instrument for psychiatric research and practice. Psychiatry Research, 28(2), 193-213.

[8] Galesic, M., & Bosnjak, M. (2009). Effects of questionnaire length on participation and indicators of response quality in a web survey. Public opinion quarterly, 73(2), 349-360.

[9] Famodu, O. A., Barr, M. L., Holásková, I., Zhou, W., Morrell, J. S., Colby, S. E., & Olfert, M. D. (2018). Shortening of the Pittsburgh Sleep Quality Index Survey Using Factor Analysis. Sleep Disorders, 2018, 1–9. https://doi.org/10.1155/2018/9643937.

[10] World Health Organization. (n.d.). Retrieved July 16, 2021, from https://apps.who.int/adolescent/second-decade/section2/page1/recognizing adolescence.html.

[11] United Nations, Department of Economic and Social Affairs, Population Division (2015). World Population Prospectus: The 2015 Revision, Key Findings and Advance Tables. Working Paper No. ESA/P/WP .241.

[12] UNFPA India. (2020, August 17). Retrieved July 16, 2021, from https://india.unfpa.org/en/unfpa-india.

[13] Union education Minister announces release of report of All India Survey on Higher Education (AISHE) 2019-20. (n.d.). Retrieved July 16, 2021, from https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1725914.

[14] Jayan, T. (2020, February 28). India is sleep deprived. Retrieved July 16, 2021, from https://www.thehindubusinessline.com/blink/cover/india-is-sleep-deprived/article30941668.ece.

[15] Campsen, Nathalie &Buboltz, Walter. (2017). Lifestyle Factors' Impact on Sleep of College Students Austin Journal of Sleep Disorders. Austin Journal of Sleep Disorders.

[16] Hershner, S. D., &Chervin, R. D. (2014). Causes and consequences of sleepiness among college students. Nature and science of sleep, 6, 73–84.https://doi.org/10.2147/NSS.S62907

[17] Schlarb, A. A., Friedrich, A., &Claßen, M. (2017). Sleep problems in university students - an intervention. Neuropsychiatric disease and treatment, 13, 1989–2001. https://doi.org/10.2147/NDT.S142067.

[18] Sleep &social Media: Staying connected can keep you up. (2020, November 13). Retrieved July 16, 2021, from https://www.sleepfoundation.org/how-sleep-works/sleep-and-social-media.

[19] Philip, P., Taillard, J., Sagaspe, P., Valtat, C., Sanchez-Ortuno, M., Moore, N., ... &Bioulac, B. (2004). Age, performance and sleep deprivation. Journal of sleep research, 13(2), 105-110.

[20] Brain basics: Understanding sleep. (n.d.). Retrieved July 16, 2021, from https://www.ninds.nih.gov/Disorders/patient-caregiver-education/understanding-sleep.

[21] Al Salmani, A. A., Al Shidhani, A., Al Qassabi, S. S., Al Yaaribi, S. A., & Al Musharfi, A. M. (2020). Prevalence of sleep disorders among university students and its impact on academic performance. International Journal of Adolescence and Youth,25(1), 974-981. doi:10.1080/02673843.2020.1815550.

[22] Hershner, S. D., &Chervin, R. D. (2014). Causes and consequences of sleepiness among college students. Nature and science of sleep, 6, 73–84. https://doi.org/10.2147/NSS.S62907.

[23] McKight, P. E., &Najab, J. (2010). Kruskal-wallis test. The corsini encyclopedia of psychology, 1-1.

[24] SPSS statistics - overview. (n.d.). Retrieved September 01, 2021, from https://www.ibm.com/products/spss-statistics
[25] Datawrapper. (2021, April 16). Retrieved July 16, 2021, from https://www.datawrapper.de/.
[26] Hyyppa, M. (1989). Quality of sleep and chronic illnesses. Journal of Clinical Epidemiology,42(7), 633-638. doi:10.1016/0895-4356(89)90006-1.
[27] Ferrie, J. E., Shipley, M. J., Akbaraly, T. N., Marmot, M. G., Kivimäki, M., & Singh-Manoux, A. (2011). Change in sleep duration and cognitive function: findings from the Whitehall II Study. Sleep, 34(5), 565–573. https://doi.org/10.1093/sleep/34.5.565.
[28] Alhola, P., & Polo-Kantola, P. (2007). Sleep deprivation: Impact on cognitive performance. Neuropsychiatric disease and treatment, 3(5), 553–567.
[29] How much sleep do we really need? (2021, March 10). Retrieved July 16, 2021, from https://www.sleepfoundation.org/how-sleep-works/how-much-sleep-do-we-really-need.
[30] Gupta, S. (2013). Sleep Disorder, its Medications and their Vulnerabilities. Indian Science Cruiser, 27(4), 30-33.
[31] Holding, B. C., Sundelin, T., Cairns, P., Perrett, D. I., &Axelsson, J. (2019). The effect of sleep deprivation on objective and subjective measures of facial appearance. Journal of sleep research, 28(6), e12860.
[32] Czeisler, C. A. (2015). Duration, timing and quality of sleep are each vital for health, performance and safety. Sleep Health, 1(1), 5-8. doi:10.1016/j.sleh.2014.12.008.
[33] Lucy Foulkes Lecturer of Psychology in Education. (2021, January 12). Majority of university students report poor quality sleep, putting them at higher risk of mental health problems. Retrieved July 16, 2021, from https://theconversation.com/majority-of-university-students-report-poor-quality-sleep-putting-them-at-higher-risk-of-mental-health-problems-110746.
[34] Grading in education. (2021, June 29). Retrieved July 16, 2021, from https://en.wikipedia.org/wiki/Grading_in_education.
[35] Díaz-Morales, J. F., &Escribano, C. (2015). Social jetlag, academic achievement and cognitive performance: Understanding gender/sex differences. Chronobiology international, 32(6), 822-831.
[36] Alhola, P., & Polo-Kantola, P. (2007). Sleep deprivation: Impact on cognitive performance. Neuropsychiatric disease and treatment, 3(5), 553–567.
[37] Rabiner, D. L., Carrig, M. M., & Dodge, K. A. (2016). Attention Problems and Academic Achievement: Do Persistent and Earlier-Emerging Problems Have More Adverse Long-Term Effects?. Journal of attention disorders, 20(11), 946–957. https://doi.org/10.1177/1087054713507974.
[38] Kabrita, C. S., & Hajjar-Muça, T. A. (2016). Sex-specific sleep patterns among university students in Lebanon: impact on depression and academic performance. Nature and science of sleep, 8, 189–196. https://doi.org/10.2147/NSS.S104383.

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Conflict of Interest
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