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Research Article

The Impact of Sleep Patterns on the Academic Performance of Undergraduate Students: A Behavioral and Cognitive Study

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Abstract

Sleep is Crucial to Cognitive Function, Academic Performance, and General Well-being. In this study, the sleeping habits of undergraduate students and their effects on academic performance were examined. Data from undergraduate students of different colleges were collected through a questionnaire that addressed sleeping duration, bedtime routines, academic performance, and the perceived influence of sleep on study effectiveness. The study reveals that a significant proportion of student sleeps less than the recommended 7–8 hours nightly, with most of them going to bed after 11 PM. There was a high correlation between inadequate sleep and greater difficulty in waking up, feeling tired during lectures, resulting in reduced attentiveness in the classroom, and poorer perceived academic performance. Moreover, the students who reported getting an adequate amount of sleep scored higher GPAs and demonstrated improved time management of

assignments and class participation. The study emphasizes the role of sleep hygiene in academic performance and stress management. It stresses the necessity of awareness programs, which will enable students to learn about the advantages of healthy sleeping habits to enhance their academic performance and overall well- being.

Keywords: Sleep hygiene, Academic progress, Inadequate Sleep, Sleep cycle, Stress Management.

Introduction

Sleep is a fundamental biological process essential for physical and mental well-being, defined as a naturally recurring state of rest in which the body and mind can recover and rejuvenate. It is a vital component of maintaining cognitive function, emotional regulation, and overall health of an individual. [4] Despite its importance, sleep is often neglected by many undergraduate students due to academic pressures, social engagements, and extracurricular activities.[2] The relationship between sleep and academic performance has garnered increasing attention in recent years, especially in the context of higher education. Academic success, often measured by Grade Point Average (GPA), is a critical factor in shaping the educational outcomes and prospects of students. Studies have consistently shown that the quality and quantity of sleep can significantly influence cognitive functions such as memory retention, concentration, problem- solving skills, and overall mental agility, all of which are crucial for academic achievement.[8] This paper aims to explore the impacts of sleep on the academic performance of undergraduate students, specifically examining how sleep deprivation and poor sleep habits contribute to lower GPAs, while also highlighting the importance of promoting healthy sleep practices to enhance academic outcomes.[9]

Methodology

Data collected from college students consisted of 137 records. Since the gathered data was incomplete in some manner, so data was preprocessed, and 112 records of students were left. Data was gathered from various UG colleges and courses like Computer Science, Information Technology, Botany, Data Science, Environmental Science etc. The age group of students varied from 18 to 25 out of which 47.32% were females and 52.68% were males.

Data Collection

Google Forms was prepared which consisted of 25 questions from various aspects like academic performance, sleep patterns etc., validated by academic expert ensuring hiding the identity of the students, data security was maintained. To collect the data, google form was floated on various

WhatsApp group. The responses received were recorded in MS Excel sheets.

Data Cleaning & Preprocessing

The collected data consisted of 137 records which needed preprocessing. The Data consisted of missing values, incorrect responses, incorrect format of entry, outlier etc. All this were removed or replaced or corrected during this Stage. Python's Pandas library was used along with MS-Excel's features for data cleaning. Using Pandas data was transformed into consistent format for better analysis and study.

Data Visualization & Analysis

Power Bi was used to analyze the data and to create various charts for visualizing the data for easy and better understanding.

Analysis

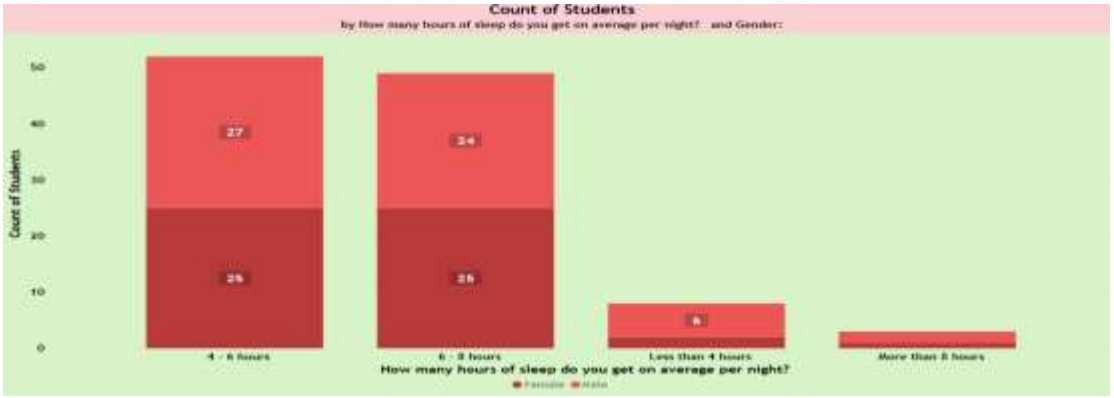

Fig 1: Students Sleep Cycle, Categorized by Gender

The chart illustrates the count of students and their sleeping hours. The key observations are:

a) Students Who Sleep 4-6 Hours get moderate sleep but not the recommended amount.[13] A significant number of students fall into this category, suggesting potential sleep deprivation effects on focus and academic performance.[11]

b) Students Who Sleep 6-8 Hours which is recommended amount, supports better cognitive function and academic performance.[15]

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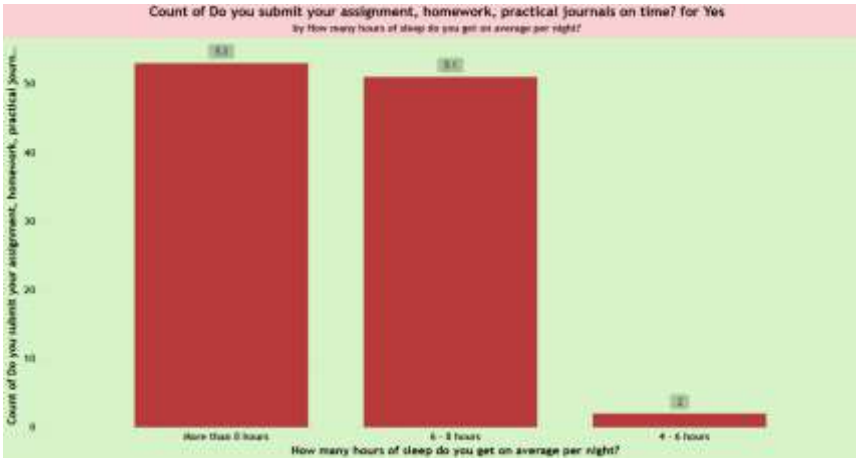

Fig 2: Frequency of On-Time Assignment Submission by Sleep Duration

This chart illustrates the relationship between the amount of sleep duration and timely submissions:

Students who sleep more than 8 hours have the highest number of timely submissions and they may have better time management skills and cognitive efficiency. Ensuring adequate sleep may help students stay organized, focused, and efficient in completing their academic tasks.

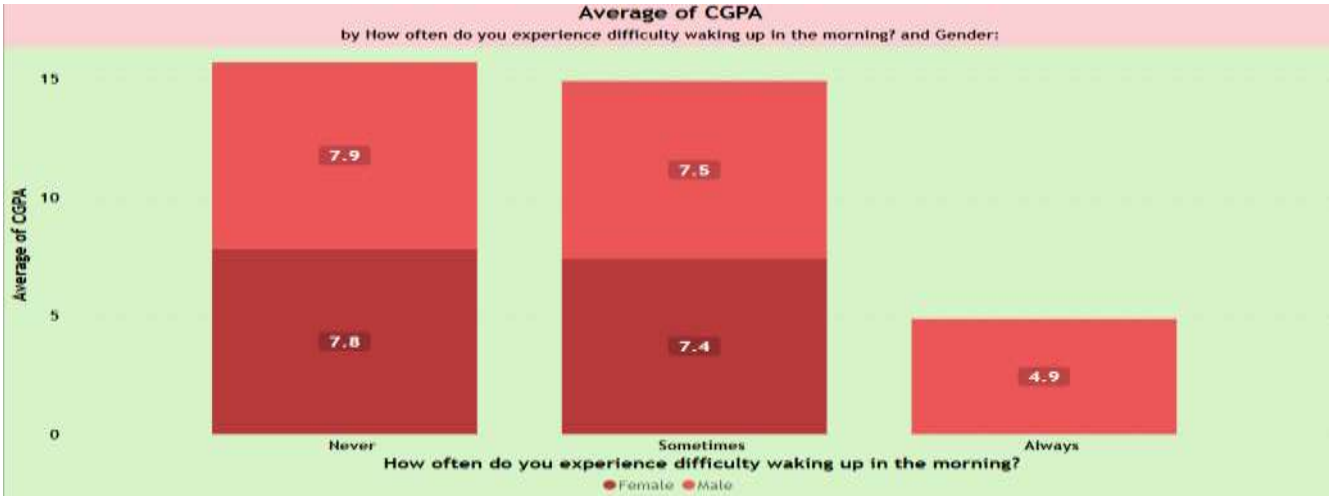

Fig 3: Impact of Waking Difficulties on Academic Performance: Average CGPA Analysis

The chart illustrates the correlation between difficulty in morning and their CGPA. The key observations are:

a) Students who wake up easily may have better sleep quality, leading to improved academic performance.[14]

b) Students who always experience difficulty waking up have the lowest CGPA of 4.9. This significant drop suggests that severe difficulty waking up may be linked to sleep deprivation or poor sleep habits, negatively affecting academic performance.[10]

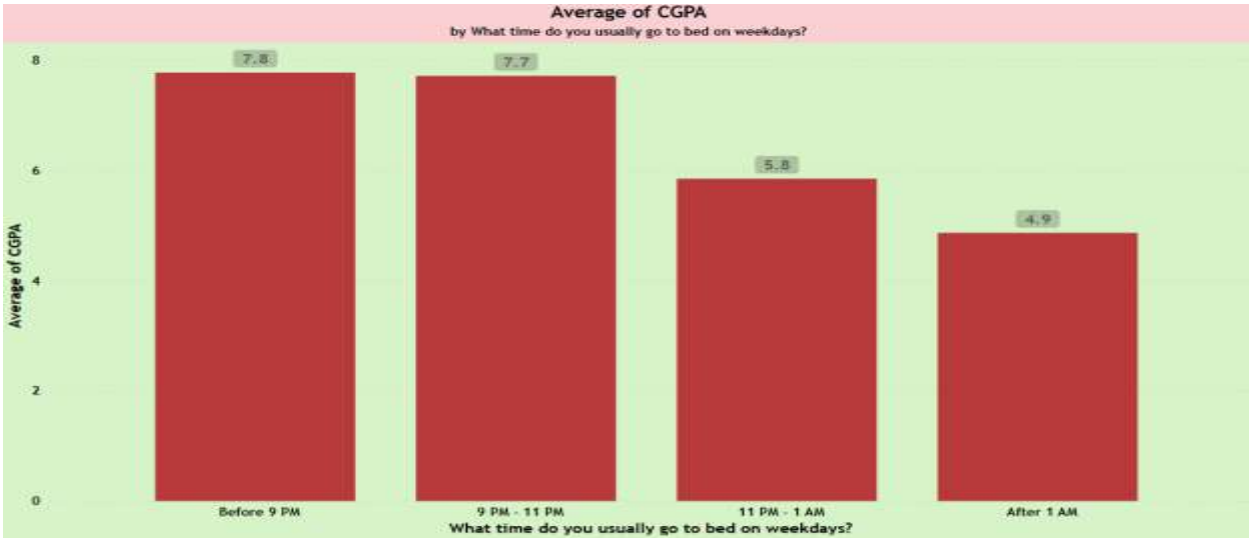

Fig 4: Impact of Sleep Timing on CGPA Performance

The chart illustrates the relationship between students' bedtime on weekdays and their average CGPA. The key observations from the data are:

- Students who go to bed before 9 PM have the highest average CGPA of 7.8. This suggests that early sleep is beneficial for academic performance.
- Students who sleep between 9 PM - 11 PM have a slightly lower average CGPA of 7.7. This indicates that maintaining a reasonable bedtime still supports strong academic outcomes.
- Students who sleep between 11 PM - 1 AM experience a significant drop in CGPA to 5.8. This suggests that staying up late may negatively affect learning and cognitive efficiency.
- The lowest CGPA of 4.9 is observed in students who sleep after 1 AM. This highlights that sleeping very late is associated with poor academic performance and reduced productivity.

Questionnaire:

Sample Questions	Yes in %	No in %
Have You received any certificate related to academics during your 3 years of graduation?	38.39%	61.61%
Do you take naps during the day?	91.96%	8.04%
Do feel sleepy during Lectures or Practical?	91.96%	8.04%
Do you tend to perform better on tests when you are well-rested?	94.64%	5.36%
Do you use your phone late at night (after 10 PM)?	91.09%	8.01%
Do you believe that good sleep helps you manage academic stress better?	97.32%	2.68%
Do you attend all lectures and practical regularly?	92.86%	7.14%
Do you submit your assignment, homework, practical journals on time?	96.43%	3.57%
Do you participate in classroom discussion or activities?	94.64%	5.36%
Have you noticed any correlation between sleep disruptions and your academic performance?	98.21%	1.79%

Table 1: survey responses in percentage (%) about the correlation between sleep patterns, academic performance, and student habits during graduation.

Results:

- The study shows that, out of 112 records, 67.2 % students are sleep deprived (less than 6 hours average sleep everyday) and the number males are comparatively greater than females in being sleep deprived out of 59 male students 55.93 % are sleep deprived. Out of 53 females 50.94 are sleep deprived.
- It was observed that 8.04% student feels sleepy during lectures or practical impacting poor attendance, less attentiveness and failure in submitting assignment on time which in turn adversely affect their academic performance.
- Many students use their mobiles after 10 pm, in many research its proven that blue rays coming from the screens of mobile phones can affect the sleep negatively[16] and also it triggers the release of Cortisol hormone which keeps mind active throughout the night, affecting the quality of their sleep which makes difficult for students to wake up on time, in morning increasing the absenteeism in the college.[32]
- In this study, out of 112, 58 students have difficulty in waking up which is whooping 51.78 % percent.
- Out of 112 students only 8.92 % have missed their lecture or practical because of lack of sleep.

- During exams students are under constant pressure which also reflected on our results, 87.5% of students don't feel well rested during their exams which can affect mental as well as physical health of students.
- 97.32% students have agreed that good sleep helps them to manage their academic stress.
- 98.21% students noticed correlation between sleep disruptions and your academic performance.

Limitations

This study has several limitations that must be acknowledged. First, it relies on self- reported data, which may introduce bias as participants could provide inaccurate or socially desirable responses. Second, the sample size is restricted to undergraduate students, which limits the ability to generalize the findings to other populations, such as graduate students or individuals in different educational or professional settings.

Additionally, external factors such as diet, exercise, and mental health were not considered, despite their potential influence on both sleep and academic performance.[28] Finally, the study is correlational in nature, meaning it does not establish a causal relationship between sleep and academic performance, only highlighting the association between the two variables. These limitations suggest the need for future research to address these aspects and provide a more comprehensive understanding of the topic.

Conclusion

This study highlights the importance of adequate sleep in academic success, insufficient sleep can lead to cognitive impairment, poor attention, reduced ability to process information, and even decreased motivation, all of which can negatively impact a student's GPA. [1] The research shows that student having better sleep hygiene tend to have better academic performance, improved attentiveness and overall mental agility. [6][12] Understanding the connection between sleep and academic performance is critical as it provides insights into how lifestyle choices surrounding sleep can be optimized for academic success. To improve academic outcomes, institutions should consider promoting sleep awareness programs and encouraging healthier sleep habits among students.[3]

Recommendations

Universities and colleges should consider educating students on the importance of good sleep hygiene. This can be done through awareness campaigns, workshops, and seminars that highlight the connection between sleep quality and academic success.

Parents should d encourage their children to prioritize sleep, especially during exam periods, to help improve their focus, memory, and overall performance.

Also college should implement Flexible Scheduling and Study Sessions This would allow students to manage their study time while ensuring they maintain healthy sleep patterns.

Future Work

The findings from this research lay the groundwork for further exploration into the relationship between sleep and academic performance. In future studies, machine learning models will be developed using the data collected in this study to predict academic outcomes based on sleep- related factors. The primary focus will be on exploring how different sleep habits, such as sleep duration, frequency of feeling sleepy in class, and late-night phone usage, impact students' academic performance, as measured by CGPA and other academic metrics

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