

Effect of Sleep Deprivation on the Academic Performance and Cognitive Functions among the College Students: A Cross Sectional Study

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ABSTRACT

Background: Sleep is an important biological necessity, College students often have erratic sleep schedules, poor sleep hygiene and poor sleep quality, which might affect their performance and cognitive functions.

Objective: To find out the effect of sleep deprivation on the academic performance and cognitive functions among the college students.

Materials and Methods: A cross-sectional design- A self-administered paper questionnaire was administered of first-year through final-year BPT, BMLT and BMIT students. The grade point average was recorded for the academic performance.

Results: A total of 150 respondents, with a response rate of 75%, were obtained. 143 (95.3%) students obtained less than the recommended 7-8 hours of sleep. The students whose GPA was lower were associated with lesser sleep duration had sleep deprivation. The cognitive functions of college students like memory, attention, concentration was also impaired.

Conclusion: Academic performance and cognitive functions of the students who were sleep deprived was poor. . Hence, appropriate sleep is integral part of better academic performance and cognitive function.

Keywords: Sleep deprivation, academic performance, cognitive function, grade point average

INTRODUCTION

Sleep is defined as naturally recurring state of mind and body characterized by altered consciousness, relatively inhibited sensory activity, inhibition of nearly all voluntary muscles and reduced interactions with surroundings.^[1] Sleep is crucial for proper brain function. an integral part of human health and life. It is crucial for learning, performance, and physical and mental health.^[2] The human body normally requires seven hours of night sleep and eight to nine hours of daily sleep.^[3,4]

Sleep deprivation is defined as obtaining inadequate sleep to support adequate daytime alertness, Sleep deprivation is inversely proportional to hours of sleep and it may have a substantial adverse effect on general health and quality of life.^[4,5,6]

Academic performance is defined as the extent to which a student has achieved their short or long-term educational goals. Cumulative Grade Point Average (GPA) and the results that the students have achieved in

their High school or Bachelor degree courses represent their academic performance. A cumulative grade point average is a calculation of the average of all a student's total earned points divided by the possible amount of points. Existing evidence does suggest an association between sleep and GPA. Students who obtained more sleep (long sleepers > 8 hours) had higher GPAs than short sleepers (< 6 hours).^[7]

Cognitive functions can be defined as cerebral activities that lead to knowledge, including all means and mechanisms of acquiring information. Cognitive functions encompass reasoning, memory, attention and language and lead directly to the attainment of information and, thus, knowledge. Chronic and acute sleep deprivation negatively impact thinking and learning.^[8]

The current study hypothesized whether the academic performance and cognitive functions of college students may or are not affect by sleep deprivation.

Hence, Current Research was intended to find how sleep deprivation effect the academic performance and cognitive functions of the college students?

The objectives of the study was to determine the effect of sleep deprivation on the academic performance and cognitive functions among the college students.

MATERIALS AND METHODS

Research Design: Cross sectional design

Sample Size: 150 college students

Sampling Design: Convenient sampling

Source of Data: Data was collected from Acharya Institute of Health Science, Bangalore.

Inclusion criteria:

- Normal healthy college students
- Participants with age group 18-24 years
- Students willing to participate in this study

Exclusion criteria:

- Students with any sleeping disorders like insomnia
- Students on medications
- Students with part-time jobs

PROCEDURE

200 healthy subjects (N=200) were included in the study age group 18 to 24 years. Written consent was obtained from all the 200 subjects. Each subject was screened for, and excluded if the subjects had not met the inclusion criteria. Then the purpose of the study was explained to the subjects. An anonymous, voluntary, self-administered questionnaire was given to the subjects. The GPA of every subject was recorded. These average scores were considered as their academic performance in the present study.

DATA ANALYSIS

Performed using SPSS version 16. Descriptive statistics were performed for the demographic variables. Mean, standard deviation and percentage was calculated. PLUM ordinal regression was done for GPA.

RESULT

The questionnaire was distributed to 200 students and completed questionnaires were received from 150 students.

79 (52.7%) students feel that their academic performance is hindered due to insufficient sleep. 118(78.7%) students felt that they are sleep deprived as a college student.

Table 1: Demographic information of 150 students

Descriptive Statistics					
Characteristics	N	Minimum	Maximum	Mean	Std.Deviation
Female	73	18.00	24.00	19.8493	1.31942
Male	77	19.00	24.00	20.7922	1.46303

Table 2: Parameters of sleep deprivation

Parameters	Highest			Lowest		
		Frequency	%		Frequency	%
Regular sleeping hours	6-7 hours	67	44.6%	7-8 hours	7	4%
Time taken to fall asleep at night	30 minutes	86	57%	less than 10 minutes	22	14.7%
Yawning during class hours	very often	70	46.7%	not often	4	2.6%

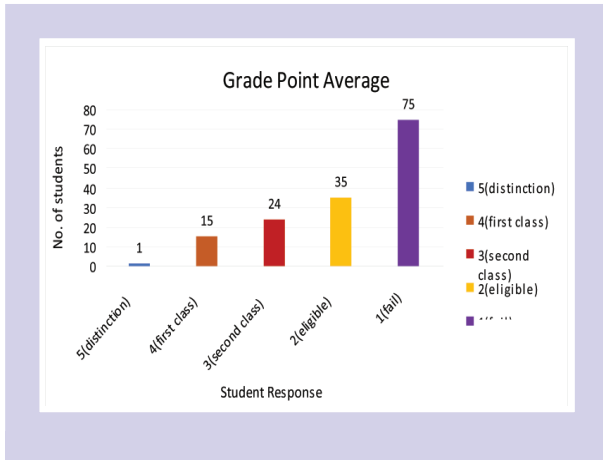
Table 3: Focus on Performance and Cognitive Function

Do not sleep well or lack of sleep	Yes		No	
	Frequency	%	Frequency	%
Unable to stay awake or focused during classes	132	88%	18	12%
Unable to focus during exams	81	54%	69	49%
Feels less energy or motivation	125	83.3%	25	16.7%
Weakened immune system	62	41.3%	88	58.7%
Feels academic performance is hindered	79	52.7%	71	47.3%

Table 4 : Grade Point Average

Grade Point Average	No. of students (Total No. =150)	No. of students who are sleep deprived	%	No. of students who are not sleep deprived	%
4 (distinction)	1	NIL	NIL	1	0.7%
3 (first class)	14	13	0.87%	1	0.7%
2 (second class)	24	21	14%	3	2%
1 (eligible)	34	21	14%	13	8.7%
0 (fail)	77	63	42%	14	9.3%

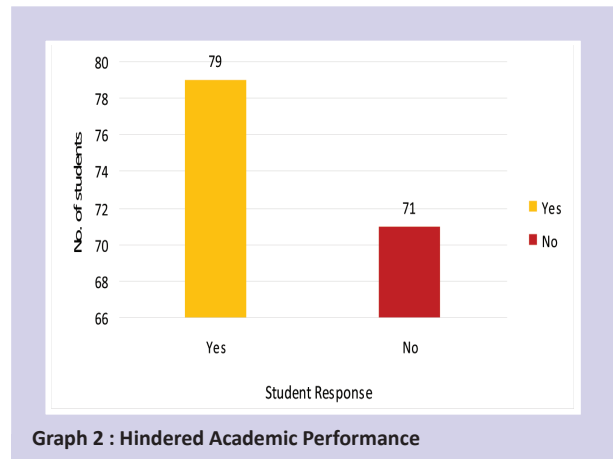
Effect of Sleep Deprivation on the Academic Performance and Cognitive Functions



Interpretation: This graph shows the students grade that they have scored in the exams. According to the graph, 16 (10.7%) student had GPA > 4, about 24 (16%) students had GPA=3, 35 (23.3%) had GPA =2 and about 75 (50%) students had GPA =1.

Table 6: Sleep Deprivation and Academic Performance

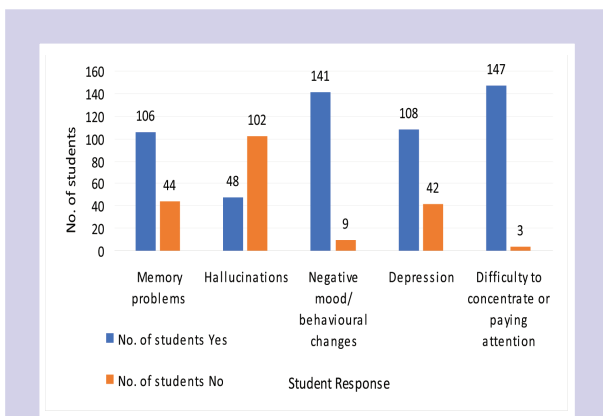
Hindered academic performance	No. of students
Yes	79
No	71



Interpretation: This graph shows that out of 150 students, 79 (52.7%) students feels that their academic performance is hindered due to insufficient sleep.

Table 5: Sleep deprivation and cognitive functions

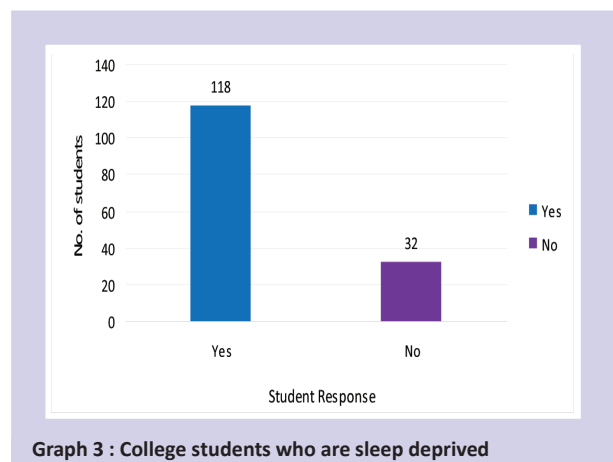
Due to lack of sleep	Yes		No	
	Frequency	%	Frequency	%
Memory problems	106	70.7%	44	29.3%
Hallucinations	48	32%	102	68%
Negative mood/ behavioural changes	141	94%	09	6%
Depression	108	72%	42	28%
Unable to pay attention or to concentrate in the class	147	98%	03	2%
Feels sleep deprived as a college student	118	78.7%	32	21.3%



Interpretation: Respondents were asked some questions about the cognitive functions. Thus, the sleep deprivation had a negative effect on the cognitive functions.

Table 7: Sleep deprived students in college

Sleep deprived	No. of students
Yes	118
No	32



Interpretation: The students were asked that whether they felt that they are sleep deprived as a college student. 78.7% students felt that they were sleep deprived and 21.3% students felt they were not sleep deprived.

Table 8: Plum Ordinal Regression For GPA

Model	-2 Log Likelihood	Chi-Square	df	Sig.
Final GPA - Sleep deprived not deprived	.000	16.094	4	.003

χ^2 value is greater than the table value at 4 degree of freedom and hence the null hypothesis is rejected and research hypothesis is proved.

Sleep deprivation adversely affect the academic performance and cognitive function. Hence sleep is an integral part of good cognitive function thereby improving academic function.

DISCUSSION

The main objective of the study was to find out the effect of sleep deprivation on the academic performance and cognitive functions in the college students. The results concluded that majority of students obtain less than the recommended 7-8 hours of sleep each night. Obtaining more than 7 hours of sleep per day for adults is essential 17 critical enough to be an objective by Healthy People 2020 to Improve national health.^[18]

44.6% students in this study slept for 6-7 hours in the night. Studies have indicated that sleep deprivation has detrimental effects on the academic performance and health.^[16] BaHammam et al.^[16] showed that students who scored excellent in college had longer sleeping hours during weekdays. This was supported by our results that students whose GPA was < 4 were 149 (99.3%), out of which 118 (78.7%) were sleep deprived. Also, a study in University of Washington showed that less sleep-deprived students have higher GPA than more sleep deprived students.^[19]

Out of 150 students, 81 (54%) students were unable to focus during examinations and had a low GPA score. This finding is consistent with Medeiros et al's research among medical students that found students who reported sleeping for longer durations obtained higher scores on examinations.^[20]

In the current study, 86 (57.3%) students require 30 minutes to fall asleep at night, 42 (28%) students take 1 hour or more to fall asleep at night and 22 (14.6%) students take only 10 minutes to fall asleep at night.

70 (46.6%) students yawn very often during the class hours due to insufficient sleep. Hardly 4 (2.6%) students do not often yawn during the class hours if they do not get sufficient sleep. So, it is inferred that most of the

students who are sleep deprived yawn very often during their class hours. 132 (88%) students are facing problem to stay awake or focused during the classes whereas only 18 (12%) students are able to focus in the classes due to sufficient sleep. 125 (83.3%) students feel that they have less energy or motivation throughout the day.

Around 66 (44%) students stress interfered their sleep. 44 (29.3%) students had lack of time management skills, hence diminished the quality or quantity of their sleep. In a study done by Ahrberg and colleagues (2012), they found that different modes of stress affect the circadian sleep rhythms of the students.^[21] A study conducted at James Madison University worked with 124 college students, and results from the research revealed that over 50 percent of the students reported high levels of stress that was related to academic workload and time management, which was linked to unhealthy behaviours such as decreased quantity of sleep (Britz and Pappas, 2014).^[22]

Sleep has an integral role in learning and memory consolidation, for memory formation of learned information, thus enabling students to recall information.^[23] In the current study, 106(70.6%) students have memory problems due to insufficient sleep. A study by Curcio, Ferrara, and De Gennaro (2006) explored the idea that sleep plays an essential role in learning and memory.^[24]

A study conducted by Shelley D Hershner and Ronald D Chervin proved that depression and sleep are interrelated and disturbed sleep is a cardinal feature of depression.^[11] Current study among 150 students, 108(72%) students felt depressed if they have had insufficient sleep for consecutive days. 48(32%) students felt hallucinations in the night during sleep if they have had insufficient sleep. Kelly and colleagues (2001), short sleepers are more prone to hallucinate in the night.^[25] 141(94%) students experience negative mood or behavioural changes when they had consecutive days of insufficient sleep and 147(98%) students face difficulty in paying attention or to concentrate lectures in the class due to lack of sleep.

Most students had the effects of sleep deprivation on academic achievements and the abilities of cognition. This was supported by a study done by Pilcher and Walters that showed that college students are unaware to what extent their sleep deprivation has on their ability to complete cognitive tasks and retain memory and deterring them from academic achievement.^[26]

Few strategies to increase sleep quality. Go to bed and wake up schedule, will help the body get used to a regular sleep cycle.^[28] Conductive Bedroom for a distraction free sleep by making it quiet, dark, comfortable in

temperature, a general relaxing environment, to make sure that one's bed is comfortable and is used only for sleeping and not for other activities such as reading or watching TV.^[27] Students use common areas and the library instead, because using the bed to complete stress related activity such as college work can be destructive to effective sleep.^[28] Avoid large meals before bed time.^[27] based on the CDC's general assessment of good sleep hygiene .

The problem of sleep deprivation can be effectively solved by integrating appropriate health interventions within the college student population.

LIMITATIONS

1. Self-reporting of the sleep habits was relying on the students' subjective accounts, which raised the possibility of accuracy.
2. Many hidden variables might have influenced the measurement of academic performance such as self-concept, motivational changes, mental stress, and social class.
3. This study was only conducted at a single institution, which makes it difficult to generalize results to students of other institutions.

RECOMMENDATIONS

1. Future research could enhance generalizability and provide further understanding of the effect of students' sleep duration and patterns.
2. Future researchers should ask participants to perform a cognitive task and compare their results to their average sleep hours per night.
3. Future researches to investigate effective and feasible interventions, which disseminate both sleep knowledge and encouragement of healthy sleep habits to college students in a time and cost-effective manner.

CONCLUSION

The main objective of the study was to find out the effect of sleep deprivation on the academic performance and cognitive functions in the college students. The results concluded that majority of students obtain less than the recommended 7-8 hours of sleep each night. The sleep deprivation had a negative effect on the students' academic performance and the cognitive functions like memory, attention, concentration etc. So, health education programs regarding duration and quality of the sleep should be emphasized in colleges to increase the awareness of the importance of a healthy sleep. It is the responsibility of the educators and college authorities to

identify the variables that lead to poor sleep quality and take a active role to empower and educate college students about good sleep habits to improve their performance.

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CONFLICT OF INTEREST :

The authors declared no conflict of interest.

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