



The influence of Sleep patterns on Cognitive Function and Decision Making in College Students

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ABSTRACT

Adequate amount of sleep is important for proper functioning at a mental and a physical level for an individual as sleep plays a crucial role in maintaining various cognitive functions such as decision making, memory, perception, etc. The research aimed on studying the complex relationship between sleep patterns and cognitive functioning and its effect on decision making amongst college students (18-24 years) and provides a deeper understanding on metacognitive and cognitive skills. The cognitive patterns (distractibility, forgetfulness, false triggering) and decision making styles (rational and intuitive) of college students are more vulnerable to such problems due to academic demands, irregular schedules and compromised sleep patterns. A study on 40 college students was conducted using various standardized psychometric tools. Results shows that there were no significant relationship between sleep and cognitive pattern. Sleep showed a negative correlation with intuitive thinking style and cognitive patterns and decision making styles were also negatively correlated with

each other. Thus, sleep may not affect the overall functioning in young adults but the results may vary with age affecting the cognitive and decision making styles respectively .

Keywords: Cognitive Functions, Decision Making, Memory, Perception, College Students

Introduction

The transition to college life acts a crucial stage of a human lifespan as it creates a shift in the life of an individual and introduce them to various challenges like academic performances, making new social connections and exploring the field of their academic interests. Sleep acts as a foundation for all these cognitive functions which require decision making, learning, attention, concentration, etc; but in many cases busy life of a college student often leads to them compromising their sleep schedules which results in downfall of the potential that an individual possesses. The social life of college students involves a variety of entertainment opportunities and products that reduce sleep quality as university life is characterized by substantial freedom, minimal supervision, unhealthy habits such as smoking and drinking, and leisure activities that are conveniently available and accessible (e.g., student clubs, concerts, night bars) (Wang & Biro, 2021). To carry out various tasks in our busy lives we often tend to compromise our sleep. Inadequate amount of sleep may lead to feelings of exhaustion causing depletion of the bodily resources, negatively affecting our performance. Thus, sleep deprivation has various consequences such as sleepiness and impairments in neurocognitive and psychomotor performance thus creating difficulties in everyday life.

Okano et al. (2019) conducted a study in which wearable activity trackers were distributed to 100 college students allowing for multiple sleep measures to be correlated with in class performances like quizzes and midterm examinations. It was concluded that better quality, longer duration and greater consistency of sleep correlated with better grades thus sleep measures accounted for nearly 25% of variance in academic performance.

Sleep

Sleep is an important biological necessity and has a relevant role in learning, memory and other cognitive functions, conversely inadequate amount of sleep disrupts this processing. Adequate amount of sleep leads to enhanced focus and productivity. It also helps in proper regulation of hormones which results in betterment of mental and physical health. To carry out various tasks in our busy lives we often tend to compromise our sleep, sleep deprivation has various consequences such as sleepiness and impairments in neurocognitive and psychomotor performance thus creating difficulties in everyday life. According to Gaultney (2010), a common sleep problem among college students is sleep deprivation and resulting excessive daytime sleepiness (EDS). Both biological and social factors contribute to deprivation. The reasons for poor sleep hygiene includes alcohol and caffeine intake, stimulants, and technology, which prevents students achieving sufficient sleep time and quality. A cross-sectional survey found that 71% of students did not achieve the recommended 8 hours of sleep, with 60% classified as poor sleepers. An average of 5.7 hours sleep has been reported for students studying architecture, and sleepless nights due to academic work throughout the night, defined by the Oxford English Dictionary as an all-nighter, occurred, on average, 2.7 days a month (Patrick et al., 2017).

Insomnia, a condition defined with repeated difficulty in sleeping is a widespread health problem with reports estimating that 25-30% of general population experience such sleep problems while 10% of them suffer severe enough to meet the criteria for diagnosis of insomnia. It is a chronic condition that causes significant personal and social costs as individual with insomnia report decreased quality of life and are at a greater risk for depression and leads to higher rates of absenteeism and loss of productivity (Brochu et al., 2012).

Cognitive Functions

“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” (Rose & Ramanan, 2017). Physical inactivity and lack of sleep are one of the greatest lifestyle risks factors for decline in cognitive efficiency as an appropriate amount of sleep is important for optimum cognitive and psychological functioning. Kato et al., (2018) conducted a research on 23 young adults to examine the effect of sleep quality and daily physical activity on cognitive function in which total sleep time, amount of exercise sleep efficiency and cognitive functions were examined using various standardized tools. It was concluded that exercise amount and total sleep time had differential effects on working memory and cortical activation in the prefrontal area thus it shows that daily physical activity and appropriate sleep duration may play an important role in working memory which is one of the crucial components of cognitive functions.

Sleep patterns affecting cognitive functions

Sleep deprivation is a significant concern in the modern society, majorly occurring from lifestyle choices and environmental factors affecting the overall health. Various researches have consistently demonstrated that lack of adequate sleep is closely linked to diminished attention span and an increase in attentional lapses. This decline in attentional capabilities directly impacts an individual's ability to maintain focus and complete tasks that require concentration. Sleep deprived brain also struggles to maintain focus leading to attentional lapses as these lapses can cause an obstruction in tasks that require regular attention and continuous alertness such as driving, operating machinery and complex and analytical Tasks (Vallejo & Silvestre, 2023). Kim et al. (2001) conducted a study to evaluate the value of acute sleep deprivation on cognitive functions. 18 healthy right handed men were

deprived of sleep for 24 hours, various tests such as neuropsychological battery and calculation, digit span subtest of K-WAIS, etc. were administered before and after sleep deprivation. There were no differences in visual function, reading, writing and other intellectual process function but cognitive functions such as motor, rhythm, memory and complex verbal arithmetic functions were decreased after sleep deprivation. Thus, results indicate that sleep deprivation has a negative effect on cognitive functions, especially those associated with the right anterior hemisphere or subcortical areas.

Decision Making

“Decision making is the study of identifying and choosing alternatives based on the values and preferences of the decision maker. Making a decision implies that there are alternative choices to be considered, and in such a case we want not only to identify as many of these alternatives as possible but to choose the one that best fits with our goals, objectives, desires, values, and so on” (Harris , 1980).

Effective decision making requires a combination of critical and creative thinking skills, problem solving skills, emotional and intelligent competence, etc. in order to make a decision an individual must first gather all the required information and identify and understand the problem and thus evaluate all the possible findings and may reach a conclusion of making an effective decision.

Aidman et al. (2019) studied that fatigue inducing conditions such as sleep loss compromise various factors causing leading to decline in decision making performance they used a 40 hour sleep deprivation protocol to examine it on young adults (20-30 years), various tests such as psychomotor vigilance, task switching and working memory were used, the assessment

took place in both morning and night for two consecutive days and the results indicated that the decline in complex decision making under fatigue inducing conditions might be facilitated by metacognitive rather than cognitive mechanisms.

Purpose

The purpose is to study the influence of sleep patterns on cognitive functions and decision making in college students.

Hypothesis

- Sleep will be significantly correlated with cognitive patterns.
- Cognitive patterns and decision making styles will be significantly correlated with each other.

Method

Sample

A group of 40 people were administered from the Delhi NCR area , the age group of subjects ranges from 18-25 years.

Measures

- **Pittsburgh Sleep Quality Index - Short Version** as developed by Diestel et al. (2015) consists of 9 items with a 4 item Likert scale, with response ranging from 0 (not during the past month) to 3 (three or more times a week). It assesses components like sleep disturbances and daytime dysfunction.

- **Cognitive Assessment Questionnaire** as developed by Broadbent et al. (1982). It consists of 25 items with three sub dimensions; forgetfulness, distractibility and false triggering items with each rating on 4 point Likert scale and the responses ranging from 4 (very often) to 0 (never).
- **Decision Styles Scale** developed by Hamilton and Mohammed (2016), it is a 10 item scale designed to assess the manner by which individuals make decisions. It contains two sub dimensions; rational decision style and intuitive decision style with each rating on 5 point Likert scale, response ranging from 1 (strongly disagree) to 5 (strongly agree).

Procedure

The participants were informed about the purpose of research. Participants were told to fill the forms with their most honest opinions on the asked questions. Each participant was thanked for their participation and cooperation and it was made sure that the confidentiality of their response will be our utmost priority. Further, the scoring was done following interpretation of results and defining conclusion.

Result

Table 1

N, Mean and Standard deviation

	sleep	forgetfulness	distractibility	false triggering	rational	intuitive
N	40	40	40	40	40	40
Mean	8.43	14.8	16.6	13.4	19.0	15.1
Standard deviation	4.57	7.77	6.81	7.62	5.18	4.58

Table 2

Correlation

	sleep	forgetfulness	distractibility	false triggering	rational	intuitive
sleep	—					
forgetfulness	0.229	—				
distractibility	0.259	0.847 ***	—			
false triggering	0.173	0.895 ***	0.792 ***	—		
rational	-0.114	-0.407 **	-0.196	-0.512 ***	—	
intuitive	-0.332 *	-0.235	-0.235	-0.160	0.422 **	—

Note. * $p < .05$, ** $p < .01$, *** $p < .001$

Discussion of Results

The results found out that intuitive decision making style shows a negative correlation with sleep ($r=-0.332$, $p < .05$). Distractibility has a positive correlation with forgetfulness ($r=0.847$, $p < .001$), false triggering also has a positive correlation with forgetfulness ($r=0.895$, $p < .001$) and rational thinking style has a negative correlation with forgetfulness ($r=-0.407$, $p < .01$). False triggering is positively correlated with distractibility ($r=0.792$, $p < .001$). Rational thinking is negatively correlated with false triggering ($r=-0.512$, $p < .001$) intuitive thinking is positively correlated with rational thinking ($r= 0.422$, $p < .01$).

Schyner et al. (2009) conducted a study to examine the cognitive and neural consequences of sleep deprivation on decision making. The researcher used fMRI to examine the neural changes with simple and integrated decision making under sleep deprivation. After 24 hours of sleeplessness, there was minimal effect on simple decision making but there was complete vulnerability on integrated decision making accompanied by breakdown in task specific neural performance correlated with behavioural performance.

Zavecz et al. (2020) aimed to study the relationship between subjective sleep quality and wide range of cognitive functions in a healthy young adult sample combined across the studies. They used standardized tools such as Pittsburgh sleep quality index and tested working memory, executive functions, etc. The results showed that sleep quality is not associated with cognitive functions in healthy young adults and there are several factors to consider why there was no associations between subjective sleep and cognitive performances such as ceiling effect as sleep problems must be more common in elderly population and clinical disorders. Young adults also typically shows peak cognitive performance in their youth years irrespective of the sleep quality. Young adults are not as prone to the negative consequences of shift work as

elderly and the relationship between sleep and cognitive performances can also vary on the basis of what parameters of sleep are assessed.

Conclusion

The research was aimed at studying the influence of sleep patterns on cognitive functions and decision making in college students. A total sample of 40 individuals in the age range of 18-24 years were collected covering the area of Delhi NCR. The study shows significant correlations between the respective variables as intuitive decision making style is negatively correlated with sleep pattern, distractibility and false triggering have a positive correlation with forgetfulness. Resulting both of these variables increases or decreases with respect to forgetfulness. Rational thinking style is negatively correlated with forgetfulness while false triggering is positively correlated with distractibility, which shows that if false triggering increases distractibility also increases and vice versa. Rational thinking is negatively correlated with false triggering and intuitive thinking is positively correlated with rational thinking style. Thus, it was reported that no significant relationship was shown between sleeping patterns, cognitive functions and decision making styles in young adults but this study can be later extended to the elderly population to gain a better insight of the results. Few correlations within the sub dimensions of cognitive functions and decision making were seen which tells us that both the components have interconnectivity. Hence, better sleep is required for physical and mental rest, in order to enhance one's decision making skills , cognitive patterns should be held in consideration. Healthy lifestyle, adequate sleep, social connections and positive thinking are some of the tools which helps in building a healthy ground for both effective decision making and enhanced cognitive patterns.

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