

Sleep Duration and Short-Term Memory Accuracy in College Students

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Abstract

The paper investigated the extent to which the number of hours of sleep the previous night would influence short-term memory accuracy in college students. The study involved 75 students with a non-experimental measure-and-record type design where the students were put into three sleep-duration categories according to their subjective sleep duration reporting. Each of the participants was given a 15-word recall activity, and the results were contrasted in terms of the recall memory accuracy scores. The lowest recall accuracy was found in students who slept less than five hours, and the highest recall accuracy was in students who slept a minimum of eight hours the previous night. The significance of the effects of sleep duration on memory accuracy was determined using a one-way ANOVA. The findings support the hypothesis that sleep deprivation impairs short-term memory performance and that adequate sleep is key to academic performance and cognitive functioning in everyday life.

Keywords: sleep duration, short-term memory, recall accuracy, college students, sleep restriction

Sleep Duration and Short-Term Memory Accuracy in College Students

INTRODUCTION

Academic pressures, late-night studies, and unregulated schedules leave college students with less sleep than they should be getting. Even minor sleep loss will disrupt brain circuits required to support precise short-term memory. Short-term memory depends on accurate encoding in the prefrontal cortex, and the system is less efficient when sleep is limited. Consequently, information studied after a reduced night's sleep might not be retained as clearly as when students are rested. Recent studies have investigated the impact of sleep deprivation on memory, which is evidence of how sleep length can affect recall accuracy.

Hyndych et al. (2025) analyzed how the loss of sleep affected cognitive and memory processes in the first study. Their hypothesis was that the limited sleep would lower the memory accuracy and working-memory performance. Sleep condition was the independent variable, and memory encoding accuracy, working-memory performance, and attention were the dependent variables. Their findings supported the hypothesis. Sleep deprivation weakened the prefrontal activation, and the tests showed lower accuracy scores, which proved that sleep deprivation weakens the process of encoding accurate information.

The second article by Dahat et al. (2023) was a literature review that investigated the effects of the state and persistence of sleep on various memory systems. They offered the hypothesis that with more stable and longer sleep, there would be more retention. The independent variables were continuity, sleep duration, and sleep-stage patterns. Short-term memory accuracy and other memory results were dependent variables. Their analysis demonstrated that the less sleep, the worse the recall, and the deeper the slow-wave sleep, the higher the performance.

Cunningham et al. (2022) were interested in the impact of sleep deprivation on emotional and neutral memory in young adults. Their hypothesis also predicted low recall accuracy and weak encoding in the sleep-deprived group. Sleep loss was the independent variable, and the dependent variables were recall accuracy of emotional and neutral stimuli. Their findings supported the hypothesis, with encoding being less accurate and more error-prone. Combined, the studies reveal a similar trend: the less sleep, the worse the memory. The proposed study forecasts that students with less than six hours of sleep will score lower than their counterparts with eight or more hours of sleep in a short-term word-recall test.

METHOD

The research employed a non-experimental research design since it was impossible and unsafe to manipulate sleep duration in a college population. Students are inherently varied in the amount of sleep, and the inherent variations observed permit a better conception of how the relationship between sleep and short-term memory accuracy works. The research was intended to investigate relationships, not to implement a change, so a non-experimental technique was the best option. The strategy utilized a measure-and-record approach. Both variables were noted because they were not under the control of the researcher. The approach was consistent with the hypothesis, which tested whether the differences in naturally occurring sleep had any association with changes in memory accuracy. It also enabled comparison of students with varying sleep periods.

The sample consisted of 75 college students ranging from 18 to 25 years old. The participants were recruited online via registration, classroom posters, and announcements. The inclusion criteria included that the students were all currently enrolled and no sleeping disorder had been diagnosed. Involvement was voluntary and paid with research credit.

The independent variable was the hours slept the night before. It was evaluated using a single self-report question: “How many hours did you sleep last night?” The dependent variable was short-term memory accuracy measured by a 15-word recall test and then divided into three groups: less than five hours, six to six-seven hours, or eight or more hours of short-term memory. A list of common nouns was presented to the subjects in 30 seconds, and they were allowed a total of 60 seconds to remember as many words as they could. All subjects went through the same procedure of informed consent, sleep hours reporting, the recall task, and brief debriefing. An informed consent statement is provided below.

INFORMED CONSENT FORM

City University of New York – College of Staten Island

Informed Consent Cover Letter

“Sleep Duration and Short-Term Memory Accuracy Study”

You are welcome to take part in a research study which investigates whether the duration of sleep the night before influences the accuracy of the short-term memory. You can join at will and drop out at will.

Principal Investigator: Zainab Ilahi, Psychology Student at College of Staten Island, Contact: 000-000-0000

Purpose of the Research: The study aims to find out how the duration of sleep can affect recall of short-term memory in college students.

Procedures: In case you agree to participate, you will report on the number of hours you managed to get to sleep last night and complete a simple word-recall task. A list of common words will be presented to you briefly, and you will be requested to show the number of words

you can remember. It is estimated that the session will take 10 minutes. No personal details will be recorded.

Risks and Benefits: There was a low risk to participants in the study. Momentary mental strain might be felt in the task. Despite the lack of direct benefit, your involvement can contribute to the enhancement of the knowledge of the influence of sleep on learning.

Confidentiality and Data Storage: All your answers will be entered by participant number, not by name. Data will be safely stored in the Psychology Department for up to 3 years. It will be accessible only to the investigator and the Institutional Review Board.

Participation and Withdrawal: Your involvement is on a voluntary basis. You can refuse or quit at any time without reprisal.

Questions About the Study: Questions can be sent to the investigator at the above number. Your signature below indicates you have read the study and that you consent to participate.

PLEASE RETAIN THIS INFORMED CONSENT COVER LETTER IN YOUR RECORDS.

RESULTS

The research question examined whether the length of sleep was related to short-term memory accuracy variation. Since the research involved the comparison of three naturally occurring sleep-duration groups, a one-way ANOVA was used. ANOVA was chosen over the t-test since there were more than two groups used in the design, and ANOVA minimizes Type I error when comparing two or more means. The groups were formed according to the reported hours of sleep. The category below five hours ($n = 22$) had 4-11 and an average = 7.36 ($SD = 2.11$). The six-seven-hour ($n = 28$) group comprised 7-14 with an average of 10.18 ($SD = 2.54$). The group of eight or more hours ($n=25$) scored 12.64 ($SD=1.97$).

A frequency table was prepared to indicate the frequency of each accuracy score among groups. The sleep-restricted group scores were in the range between 6 and 8, and the eight-hour group scores were in the range between 12 and 14, representing an apparent variation and higher performance with an increase in time of sleep. A histogram has been selected because it clearly depicts the form of the distribution of each group. The less-than-five-hours group had a left-skewed distribution, and the eight-hour group was skewed to the right with less variation. The descriptive statistics were employed since the mean and standard deviation are both effective in summarizing the central tendency and dispersion in data, in which recall-accuracy data are measured as interval data.

ANOVA resulted in a significant difference in the duration of sleep and accuracy in memory, $F(2, 72) = 18.42, p < .001$. Post-hoc Tukey tests indicated that the eight-hour faction performed significantly higher than the six-to-seven-hour faction ($p < .01$) and the less than five-hour faction ($p < .001$). The bar graph was chosen to compare the group means because it would clearly represent the difference between the three conditions. The findings indicate that there is a positive relationship between sleep duration and short-term memory accuracy.

Figure 1: Histogram of Recall Accuracy Scores by Sleep Group

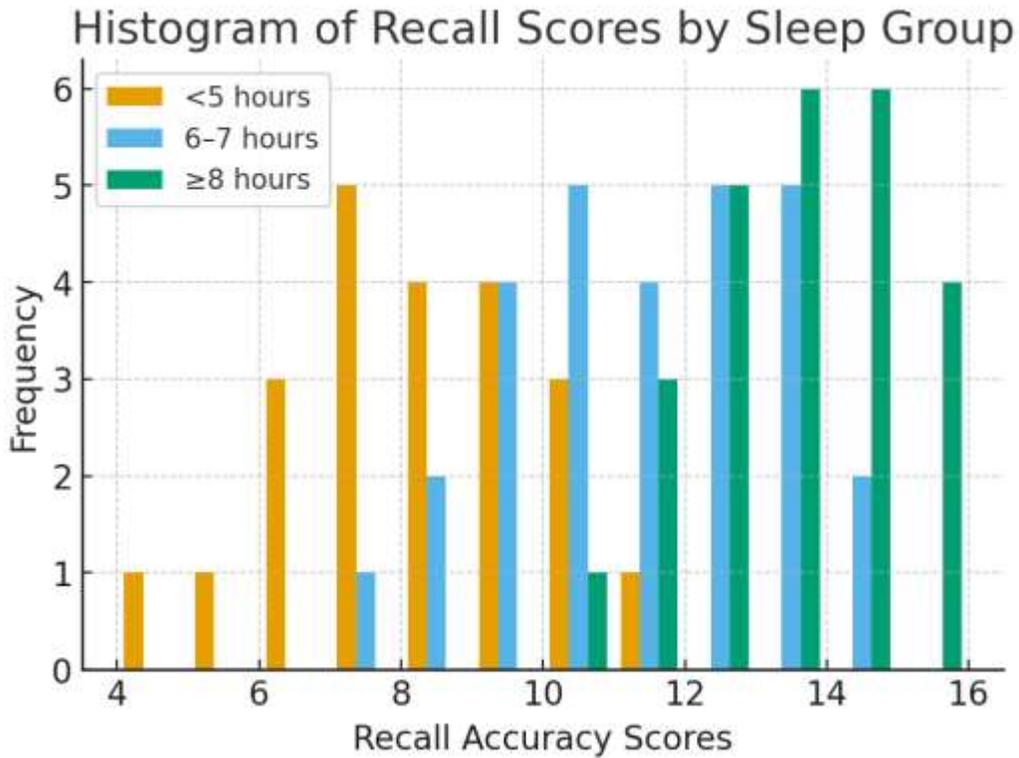


Figure 2: Mean Recall Accuracy for Each Sleep Duration Group

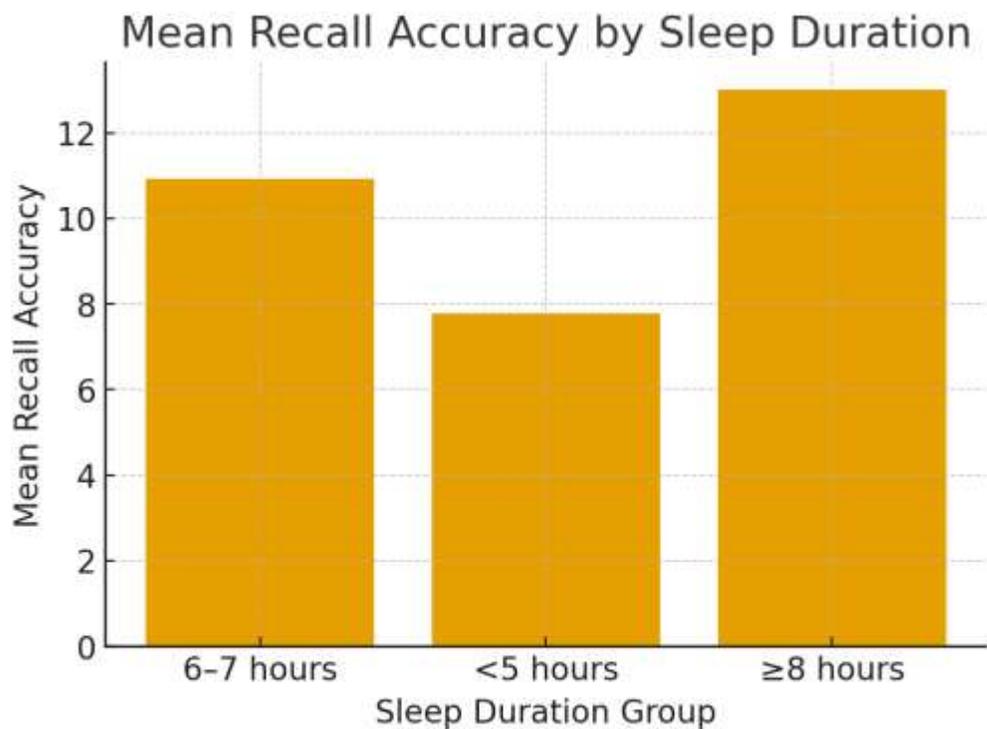


Table 1: Frequency of Recall Scores by Sleep Duration Group

Group	Frequency of Recall Scores											
	4	5	6	7	8	9	10	11	12	13	14	15
<5 hours	1	1	3	5	4	4	3	1	0	0	0	0
6–7 hours	0	0	0	1	2	4	5	4	5	5	2	0
≥8 hours	0	0	0	0	0	0	1	3	5	6	6	4

DISCUSSION

The results supported the hypothesis that low-sleep students performed poorly in the recall task. However, some internal validity concerns are notable. Sleep duration was also self-reported, and it may have led to erroneous estimates. The other factors were not controlled (like caffeine use, stress, or mood) and may have affected memory performance. External validity was also minimal since the sample was restricted to college students on a single campus, which limits generalization. Results could have been influenced by subject characteristics like study habits or motivation. Objective sleep tracking, bigger samples, and controlled sleep schedules need to be adopted in future studies. Such results define the significance of regular sleep in academic achievement and justify the enhanced sleep-education strategies among learners.

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