

RESEARCH ARTICLE

Association of sleep quality and spatial and verbal memory in young adults

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ABSTRACT

Background: Sleep is the basic need and essential for survival. Although the exact reason for sleep is not clear till date, it plays a pivot role in regulating most of the body functions. Sleep quality has an impact on the cognitive functions such as learning and memory. Spatial and verbal memory is important components of cognition. Further, verbal memory is essential for the student population to perform well in their academics. **Aims and Objectives:** The present study was undertaken to observe the association of sleep quality and cognitive functions in young adults. **Materials and Methods:** Eighty-two young adults within the age group of 18–24 were part of the study after obtaining the written informed consent. Sleep quality was assessed by the Pittsburgh Sleep Quality Index. Spatial and verbal memory was assessed using spatial and verbal memory test. Pearson correlation coefficient was used to observe the association between the variables. **Results:** There was a weak positive correlation between the spatial memory and sleep quality (R is 0.1272 and R^2 is 0.0162). There was a weak positive correlation between the verbal memory and sleep quality (R is 0.0866 and R^2 is 0.0075). **Conclusion:** The study presents a positive correlation between the sleep quality with the spatial and verbal memory. The study recommends further detailed studies in this area to understand the association between the sleep quality and memory.


KEY WORDS: Sleep Quality; Memory; Young Adults

INTRODUCTION

Sleep is a state of natural unconsciousness where some of the bodily functions are activated whereas some of the bodily functions are inhibited or suppressed. Although the exact function of sleep is unknown till date, the role of sleep is immense in our regular life. Lack of sleep is associated with several complications such as diabetes, obesity, and change in the mood states. Prolonged lack of sleep deteriorates the health and interrupts the homeostasis. The minimum duration

of the sleep recommended for adult is 8 h in a day.^[1] Lack of proper sleep causes increase in the daytime sleep and causes dysfunction and irritability and decreases in the performance overall.^[2-4] In recent years, sleep problems are increasing in young adults, and there was a drastic decrease in the duration of sleep in these population.^[5,6]

The present-day lifestyle has lots of stress which mainly contributes for decrease in the duration of sleep.^[7] The professional students experience still higher levels of stress than the general population. As stress and sleep influence each other, excessive stress decreases sleep and lack of sleep enhances the stress. Hence, regular screening the stress and sleep quality is highly recommended, especially for the young adults. Identifying the individuals with low sleep quality and high stress and counseling them with methods to improve sleep and manage stress helps to prevent further deterioration of their physical and mental health. Cognitive functions

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such as learning and memory are highly essential for young adults for their academic performance. It was reported that lack of sleep has negative impact on the cognitive functions which contributes to decrease in the academic performance of the students.^[8-11] Hence, there is a strong need to increase the awareness of the links between the sleep quality and cognitive functions in this student population. The current study was undertaken to observe the association between the sleep quality and the memory in young adults.

MATERIALS AND METHODS

Study Design

This was a cross-sectional study.

Study Setting

The present study was conducted at the Department of Pharmacology in collaboration with the Department of Physiology at Vishnu Dental College, Bhimavaram, Andhra Pradesh, India.

Participants, Inclusion and Exclusion Criteria

Eighty-two young adults within the age group of 18–24 were part of the study after obtaining the written informed consent. Apparently, healthy and willing participants were included in the study.

Assessment of Sleep Quality

Sleep quality was assessed using the Pittsburgh Sleep Quality Index (PSQI) questionnaire. This is a standard questionnaire to assess the sleep quality. It assesses seven components of sleep. Prior permission was obtained to use the questionnaire in our study.^[12]

Assessment of Memory

Spatial and verbal memory was assessed using spatial and verbal memory test which are standardized tests.^[13,14]

Ethical Consideration

The present study protocol was approved by the institutional research committee. Informed consent was obtained from all the participants. Confidentiality of the data was ensured.

Data Analysis

Data were analyzed using IBM Corp. Released 2011. IBM SPSS Statistics for Windows, Version 20.0. Armonk, NY. Data were presented as mean and standard deviation. Pearson correlation coefficient was used to observe the correlation between the variables.

RESULTS

Results are presented in Tables 1-3. Table 1 presents demographic data of the participants. Negative correlation was observed between the sleep latency, sleep duration, sleep medication, and daytime dysfunction and spatial memory. Positive correlation was observed between sleep quality, sleep efficiency, sleep disturbance, and global PSQI and spatial memory. Positive correlation was observed between the sleep quality, sleep latency, sleep efficiency, sleep disturbance, and global PSQI and verbal memory. Negative correlation was observed between the sleep duration, sleep medication, and daytime dysfunction and verbal memory [Tables 2 and 3].

DISCUSSION

The current study was undertaken to observe the association between the sleep quality and the memory in young adults. All the domains of sleep such as sleep quality, prolonged sleep latency, sleep disturbances, and sleep time are associated with memory.^[15] It was observed that there was negative correlation between the sleep latency and spatial memory whereas positive correlation was observed between the sleep latency and verbal memory. The reason for this different association of sleep latency with spatial and verbal memory is not clear and requires further studies. Positive correlation was observed between the sleep quality and spatial and verbal memory. Earlier studies reported that sleep quality influences the episodic, semantic, and procedural memory. It was reported that sleep increases the process of encoding and favors the memory.^[16,17] The types of memory influenced by sleep include procedural memory and declarative memory, where declarative memory is essential for the college students for their academic activities.^[18-20] In the phases of sleep, it was reported that rapid eye movement sleep plays a major role in the recall of the information and favors the consolidation.^[21,22] The present study results agree these studies as positive correlation was observed between the sleep quality and global PSQI score with both the spatial and verbal memory scores. Interestingly, Diekelmann *et al.* reported that sleep promotes the memory consolidation irrespective of time of the day the individual sleep.^[20] There are number of animal studies that reported transition or processing of the information which was learned during the sleep stages.^[19,21-26] Ellenbogen *et al.* reported that sleep speed up the process of consolidation and improves verbal memory.^[27] In contrast, other study reported that the stages of sleep do not have any effect on verbal

Table 1: Demographic data of participants

Parameter	Mean±SD
Age (years)	19.23±0.85
Height (cm)	166.05±7.55
Weight (kg)	55.87±9.45
BMI (kg/m ²)	20.39±3.5

SD: Standard deviation, BMI: Body mass index

Table 2: Association between spatial and verbal memory and sleep quality, sleep latency, sleep duration, and sleep efficiency

Variables	Sleep quality (C1)	Sleep latency (C2)	Sleep duration (C3)	Sleep efficiency (C4)
Mean±SD	1.04±0.88	0.77±0.73	0.81±0.65	1.24±1.12
Spatial memory (19.55±3.85), <i>R</i>	0.2099	-0.0579	-0.0734	0.2188
Verbal memory (18.27±3.71), <i>R</i>	0.03	0.1779	-0.0481	0.1413

SD: Standard deviation

Table 3: Association between spatial and verbal memory and sleep disturbances, sleep medication, daytime dysfunction, and total Pittsburgh Sleep Quality Index

Variables	Sleep disturbances (C5)	Sleep medication (C6)	Daytime dysfunction (C7)	Global PSQI
Mean±SD	1.17±0.43	0.17±0.53	2.01±0.78	7.18±2.21
Spatial memory (19.55±3.85), <i>R</i>	0.1175	-0.1503	-0.058	0.1272
Verbal memory (18.27±3.71), <i>R</i>	0.0536	-0.0294	-0.1461	0.0866

SD: Standard deviation, PSQI: Pittsburgh Sleep Quality Index

memory that is sleep neither favors nor decreases the verbal memory.^[28,29] It was reported that the hippocampus is affected due to the lack of sleep and this causes deactivation of the component essential for consolidation called extracellular signal-regulated kinase which causes impairment of spatial memory.^[30,31]

CONCLUSION

The study results provide research evidence for loss of sleep causing profound impairments in cognitive performance. The study recommends further detailed studies in this area to understand the association between the sleep quality and cognitive functions.

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