



The Relationship between Sleep Quality and Cognitive Functioning among Young Adults

Nabeera Fatima Khan, *B. A. (Hons.) Applied Psychology with Research, Amity Institute of Psychology and Allied Sciences (2021-2025)*

nabeerafatimakhan03@gmail.com

Abstract: This study investigates the relationship between sleep quality and cognitive functioning in young adults aged 18 to 25 years. A total of 100 participants were recruited and assessed using the Pittsburgh Sleep Quality Index (PSQI) to evaluate their sleep quality and the Cognitive Functioning Index (CFI) to measure various aspects of cognitive performance, including attention, memory, and executive function. The aim was to explore whether poor sleep quality is associated with decreased cognitive functioning in this age group, which is often affected by academic, social, and lifestyle pressures. The correlation coefficient (r) between sleep quality and cognitive failure was found to be ($r=0.3518$), indicating a moderate positive correlation between the two variables. The findings of this study contribute to a growing body of evidence emphasizing the importance of sleep for optimal cognitive functioning. Interventions that promote better sleep hygiene could be valuable in reducing cognitive errors and enhancing daily performance. Given the widespread prevalence of sleep disturbances, particularly in high-stress environments, this area of research remains critical for both clinical and educational settings.

Keywords: *Sleep Quality, Cognitive Functioning, Young adults*

1. Introduction

1.1 Sleep Quality

Sleep isn't just about the number of hours you spend in bed; the quality of that sleep is equally, if not more, crucial for one's overall well-being. High-quality sleep is characterized by falling asleep relatively quickly, experiencing uninterrupted sleep, returning to sleep quickly

after waking, spending an appropriate amount of time in each sleep stage, feeling rested and refreshed upon waking

1.2 Importance of Sleep Quality

The benefits of good quality sleep extend far beyond simply feeling less tired. It's a fundamental pillar of health, impacting nearly every system in your body and mind.

Enhanced Memory and Learning: During sleep, your brain consolidates memories, transferring information from short-term to long-term storage. Quality sleep is essential for learning new skills and retaining information.

Improved Focus and Concentration: Well-rested individuals exhibit better attention spans, concentration, and the ability to make decisions. Poor sleep quality impairs these cognitive abilities, similar to the effects of alcohol intoxication.

Increased Creativity and Problem-Solving: Sleep allows the brain to process information and make novel connections, fostering creativity and enhancing problem-solving skills.

Stronger Immune System: Sleep is a time for the body to repair and regenerate. Adequate, high-quality sleep strengthens the immune system, making you less susceptible to infections and illnesses.

Physical Performance: Quality sleep is crucial for muscle repair, growth, and recovery. Athletes and physically active individuals need sufficient restorative sleep to optimize performance and prevent injuries.

Hormonal Balance: Sleep influences the release of various hormones, including growth hormone, which is essential for development in children and adolescents and tissue repair in adults.

Improved Mood Regulation: Sleep deprivation can lead to increased irritability, anxiety, and sadness. Quality sleep helps regulate emotions, promoting a more stable and positive mood.

Reduced Risk of Mental Health Disorders: Chronic poor sleep is a significant risk factor for developing or exacerbating mental health conditions like depression and anxiety disorders.

Better Stress Management: Adequate rest enhances the body's ability to cope with stress. Sleep-deprived individuals often experience heightened stress responses.

1.3 Factors affecting Sleep Quality

Numerous factors can negatively impact the quality of your sleep poor sleep habits (sleep hygiene), stress and anxiety, uncomfortable sleep environment, poor diet and meal

timing, lack of physical activity or poor timing of exercise, underlying medical conditions, mental health disorders:

Restorative Theory: This widely accepted theory proposes that sleep is essential for the body and mind to repair and restore themselves. It suggests that NREM sleep is crucial for physical restoration (tissue repair, growth hormone release), while REM sleep is important for cognitive restoration (memory consolidation, brain tissue repair). Poor sleep quality hinders these restorative processes, leading to daytime impairments.

Circadian Rhythm Theory: This theory emphasizes the role of our internal biological clock (circadian rhythm) in regulating sleep-wake cycles and influencing sleep quality. Disruptions to this rhythm (e.g., due to irregular schedules, jet lag) can lead to poor sleep quality, characterized by difficulty falling asleep, staying asleep, and feeling rested.

1.4 Cognitive Functioning

Cognitive functioning encompasses the mental processes involved in thinking, learning, remembering, and problem-solving. It's how we perceive, process, and act upon information from our environment. These functions are essential for navigating daily life, making decisions, and interacting with the world around us.

Cognitive functioning isn't a single entity but rather a collection of interconnected abilities, often categorized into several domains: attention, executive functions, learning and memory, language, perceptual-motor function, social cognition.

1.5 Cognitive Decline

Cognitive decline refers to a noticeable and often progressive deterioration in one or more cognitive domains. It can range from mild cognitive impairment, where changes are noticeable but don't significantly interfere with daily life, to more severe forms like dementia, which significantly impair daily functioning.

Signs of Cognitive Decline may include frequent forgetfulness, especially of recent events or conversations, difficulty concentrating or maintaining focus, trouble finding the right words or expressing thoughts, challenges with planning, problem-solving, and decision-making, difficulties with spatial orientation or navigating familiar environments, changes in personality or behavior.

Information Processing Theory: This theory compares the human mind to a computer, focusing on how information is encoded, stored, and retrieved. It outlines stages like sensory memory, short-term/working memory, and long-term memory, emphasizing processes like attention, perception, and memory encoding. Development is seen as continuous improvements in these processes.

Connectionism: This approach models cognition using artificial neural networks inspired by the brain. Knowledge is represented in the connections between simple processing units. Learning occurs by adjusting the strengths of these connections based on experience. It emphasizes parallel processing and emergent properties of networks.

In young adults, sufficient and high-quality sleep is crucial for optimal cognitive functioning, supporting processes like attention, memory consolidation, learning, problem-solving, and decision-making. Conversely, poor sleep quality, characterized by insufficient duration, fragmented sleep, or sleep disorders, can lead to impairments in these cognitive domains, resulting in reduced concentration, slower reaction times, decreased productivity, and difficulties with emotional regulation. Therefore, prioritizing good sleep habits is essential for maintaining and enhancing cognitive performance in this age group.

1.6 Rationale of the Study

The rationale for a study investigating the relationship between sleep quality and cognitive functioning in young adults stems from the critical role both play in this developmental stage, impacting academic performance, productivity, mental health, and overall well-being. Young adulthood is a period of significant cognitive development and demanding responsibilities; therefore, understanding how sleep quality influences cognitive abilities like attention, memory, and executive functions is crucial. Existing research suggests a link, but further investigation is needed to elucidate the specific mechanisms and potential mediating factors within this demographic, particularly considering the prevalent sleep disruptions often experienced due to academic pressures, social activities, and technology use. Identifying and quantifying this relationship can inform the development of targeted interventions and educational strategies aimed at promoting healthy sleep habits to optimize cognitive performance and overall success in young adults.

2. Review of Literature

Tate and Main (2025) study sought to characterize the sleep of youth athletes and investigate relationships between sleep measures and cognitive function. Findings show that many youth athletes obtain less than the recommended amount of sleep. This is concerning given the importance of sleep for adolescent development. Inadequate sleep in youth athletes appears to negatively affect cognitive function. Further studies should assess how inadequate sleep in youth athletes affects both their sports performance and academic achievements.

Qian et al. (2025) investigated the two-way relationships between cognitive function and sleep quality in older Chinese adults, and to analyze the differences between sexes in these relationships using the random intercept cross-lagged panel model. There were reciprocal relationships observed between sleep quality and cognitive function among older individuals, particularly in women. Future interventions aimed at cognitive improvement may benefit from efforts to enhance sleep quality and the other way around, especially for women.

Muhammad and Kumar (2024) asserted that sleep is a vital aspect of human health and well-being, significantly influencing various cognitive functions such as attention, memory, and executive function. The purpose of this study was to investigate the relationship between sleep quality, sleep duration, and cognitive functioning in older men and women in India. This research offers evidence for the notable connection between sleep health and cognitive performance in older Indian adults, particularly among older men, where poor sleep quality and inadequate sleep duration negatively impact their cognitive abilities. Healthcare professionals should regularly assess sleep quality and appropriate sleep duration for their older patients and consider gender-specific sleep interventions as part of strategies to manage cognitive health.

Parrilla et al. (2024) examined the relationship between sleep and executive function in diverse samples of young adults. Our research aims to fill this gap by analysing how self-reported sleep quality is related to informant-rated executive function as a whole and its working memory component in a diverse sample of 29 healthy college students. Individuals in the poor sleep quality group were reported as having significantly worse executive function and working memory scores. Young adult college students who report less than 7 hours of sleep per night have lower scores on informant measures of working memory and executive function. This study raises awareness about how self-reported sleep experiences are related to other's observation of cognitive abilities in everyday life in a diverse young adult sample.

Shaikh et al. (2024) stated that poor sleep is a common public health issue that affects both physical and mental health, along with cognitive functioning. This research investigates the relationship between sleep quality, the inflammatory marker interleukin-6 (IL-6), and cognitive abilities in two age categories (18-25 years and 35 years and older) at Gulf Medical University. Our results indicate a relationship between inadequate sleep quality, increased IL-6 levels, and diminished cognitive performance.

3. Methodology

3.1 Aim

The aim of this study is to investigate the relationship between sleep quality and cognitive functioning in a sample of young adults.

3.2 Hypothesis

There will be significant relationship between sleep quality and cognitive functioning in young adults.

3.3 Variables

Independent Variable (IV): Sleep Quality

Dependent Variable (DV): Cognitive Functioning

3.4 Sampling

3.4.1 Sampling size: 100

3.4.2 Sampling Method: The population for the study consisted of school and college-going students aged between 18 to 25 years. Participants were selected using purposive sampling to ensure inclusion of individuals within the target age range and educational background. They were screened using the Pittsburgh Sleep Quality Index (PSQI) to assess sleep quality and the Cognitive Failures Questionnaire (CFI), which evaluates various aspects of cognitive functioning such as memory, attention, and executive function. These standardized tools were chosen to ensure reliable and valid measurement of the core variables under investigation. The sample size was 100 participants with 64 females and 36 males. The sample was gathered by the distribution of a google form (N = 70) and a questionnaire (N = 30) in both online and offline modes. A non-probability sampling strategy called purposeful sampling was used. A non-probability sample's members are selected using non-random criteria. Not every person has the opportunity to be involved in a situation like this. Choosing a sample that is most pertinent to the study objectives is a function of the researcher's experience and judgement in purposeful sampling, sometimes referred to as judgement sampling. One of the most affordable and time-effective sample techniques is purposeful sampling.

3.5 Measures

The ***Pittsburgh Sleep Quality Index (PSQI)*** is a widely used self-report questionnaire that assesses an individual's sleep quality over the past month. It consists of 19 questions that are grouped into seven component scores: subjective sleep quality, sleep latency (how long it takes to fall asleep), sleep duration, habitual sleep efficiency (percentage of time in bed spent asleep), sleep disturbances, use of sleeping medication, and daytime dysfunction. Each component is scored from 0 (no difficulty) to 3 (severe difficulty).¹ These seven component

scores are then summed to yield a global PSQI score, ranging from 0 to 21, with higher scores indicating poorer overall sleep quality. A global score greater than 5 is often indicative of significant sleep difficulties. The PSQI is a valuable tool for both research and clinical settings to evaluate sleep patterns and identify potential sleep problems.

The *Cognitive Failures Questionnaire (CFQ)* is a brief, self-report questionnaire designed to assess an individual's perception of the frequency of minor cognitive errors or "slips" in everyday life. Developed by Broadbent and colleagues in 1982, it consists of 25 items that describe common cognitive failures related to attention, memory, and perception in daily activities (e.g., forgetting names, losing things, reading without comprehending). Respondents typically rate how often these failures have occurred to them in a recent period (e.g., the past week or month) using a Likert-type scale, usually ranging from "never" to "very often." The total score is calculated by summing the ratings for all 25 items, with higher scores indicating a greater self-reported frequency of cognitive failures.

3.6 Procedure

The topic was selected after a thorough review of the literature on related topics, and then the research aim, objective and hypothesis were formulated. After obtaining approval from the university on the synopsis, the questionnaire for data collection was designed and then the ethical approval was taken from the supervisor. A Google form was also designed for online data collection. The form was then circulated on various social media platforms online and also offline and then total of 100 responses were received. Participants were provided with information about the study's purpose, procedures, and confidentiality measures. Informed consent was obtained from each participant, with parental consent obtained for minors. Participants completed the questionnaires in a quiet and private setting, either individually or in small groups, based on their preference and logistical feasibility. Participants were encouraged to take their time and respond to each item honestly and accurately. Any questions or concerns raised by participants were addressed promptly and respectfully. After screening for PSQI and CFI, a total of 100 data points were collected which consisted of 64 females and 36 males.

The tool used for screening were the Pittsburgh Sleep Quality Index (PSQI) and THE Cognitive Failures Questionnaire (CFI) developed by Broadbent and colleagues in 1982. After the data collected was transferred onto an Excel sheet, then it was run through the SPSS software for data analysis. Based on the results obtained, it was found that the self-esteem scale and parenting styles scale have a significant relationship. After the data analysis, a further discussion on the results was done and the study was concluded.

4. Results

The present study examined the relationship between sleep quality and cognitive failures in young adults by conducting a correlation analysis using scores from the Pittsburgh Sleep Quality Index (PSQI) and the Cognitive Failures Index (CFI). As mentioned, the final sample included 100 participants (64 females and 36 males). Participants were between the ages of 18 to 25 years old.

Table 1: *Correlation between Sleep Quality and Cognitive Failure*

S. No.	Variable	N	r	Sig
1	Sleep Quality			
2	Cognitive Functioning	100	0.35	0.01

5. Discussion of Results

The present study aimed to explore the relationship between sleep quality and cognitive failures among participants by employing standardized tools—the Pittsburgh Sleep Quality Index (PSQI) and the Cognitive Failures Index (CFI).

Sleep quality refers to how well a person sleeps, including how long it takes to fall asleep, how often they wake up during the night, how restful the sleep is, and how refreshed they feel upon waking. Good sleep quality is essential for physical and mental health, supporting memory, concentration, mood, and immune function.

In young adults, sufficient and high-quality sleep is crucial for optimal cognitive functioning, supporting processes like attention, memory consolidation, learning, problem-solving, and decision-making. Conversely, poor sleep quality, characterized by insufficient duration, fragmented sleep, or sleep disorders, can lead to impairments in these cognitive domains, resulting in reduced concentration, slower reaction times, decreased productivity, and difficulties with emotional regulation. Therefore, prioritizing good sleep habits is essential for maintaining and enhancing cognitive performance in this age group.

The correlation analysis revealed a moderate positive association ($r = .35$) and significance at 0.01 level between poor sleep quality and the frequency of cognitive failures. These findings indicate that individuals reporting lower quality of sleep also reported experiencing more lapses in memory, attention, and perception in their everyday activities. This result aligns with prior research suggesting that inadequate sleep impairs cognitive processes such as attention, working memory, and executive functioning. Poor sleep may reduce the brain's ability to consolidate memories, process information efficiently, and maintain sustained attention, all of

which are crucial for everyday functioning. Thus, even moderate disruptions in sleep patterns could manifest as noticeable declines in cognitive performance.

Prior research has consistently shown that poor sleep quality is linked to impairments in various cognitive domains, including attention, memory, and executive functioning. For instance, Killgore (2010) found that even modest sleep deprivation can lead to noticeable declines in attention and working memory. Similarly, Fortier-Brochu, Beaulieu-Bonneau, Ivers, and Morin (2012) reported that individuals with chronic insomnia experience significant cognitive deficits compared to good sleepers, particularly in areas related to sustained attention and episodic memory. The current study's results align with these findings, reinforcing the idea that sleep disturbances can manifest as everyday cognitive errors.

Moreover, research by Drummond et al. (2006) has indicated that sleep deprivation affects the prefrontal cortex, a brain region critical for higher-order cognitive functions such as planning, decision-making, and error monitoring. As such, frequent cognitive failures among individuals with poor sleep may be partially explained by diminished prefrontal cortex efficiency. This biological mechanism provides further support for the observed correlation in the present study.

The use of self-report measures such as the PSQI and CFI adds ecological validity to the findings, as they capture participants' real-world experiences. However, this also introduces the potential for subjective bias, as individuals may underreport or overreport symptoms based on their perceptions or mood states. Moreover, while the correlation is statistically significant and supports the hypothesized relationship, it is not strong enough to imply a direct or deterministic link between sleep and cognitive functioning.

The study found a moderate positive correlation between poor sleep quality and increased cognitive failures, such as memory lapses and attention issues. This suggests that inadequate sleep impairs cognitive processes, and promoting better sleep hygiene could help reduce errors and enhance daily performance. However, the study's reliance on self-report measures introduces potential biases, and future research should explore longitudinal designs to better understand the relationship.

It is also important to consider that other variables not accounted for in the present study—such as psychological distress, lifestyle habits, or underlying health conditions—may play a mediating or moderating role in the relationship between sleep and cognitive performance. Future research should consider longitudinal or experimental designs to better understand the directionality and causal mechanisms of this relationship.

6. Conclusion

The current study investigated the relationship between sleep quality and cognitive failures using the Pittsburgh Sleep Quality Index (PSQI) and the Cognitive Failures Index (CFI). The findings revealed a moderate positive correlation between poor sleep quality and increased cognitive failures, suggesting that individuals who experience poorer sleep are more likely to report everyday cognitive lapses. These results underscore the critical role of sleep in maintaining cognitive performance and attentional functioning. The findings of this study contribute to a growing body of evidence emphasizing the importance of sleep for optimal cognitive functioning.

References

- Muhammad, T., Anil Kumar, A. S., & Sekher, T. V. (2024). Gender-specific associations between sleep quality, sleep duration and cognitive functioning among older indians: findings from WHO-SAGE study. *Sleep Science and Practice*, 8(1), 6.
- Parrilla, M. M., Kautiainen, R. J., & King, T. Z. (2024). Sleep quality and executive function in a diverse sample of healthy young adults. *Applied Neuropsychology: Adult*, 1-9.
- Qian, S., Yong, C., Li, S., Peng, J., Li, X., Ye, Q., ... & Zhou, J. (2025). Bidirectional Relationships Between Sleep Quality and Cognitive Function in Older Chinese Adults: Observational Analysis of SAWA Trial. *American Journal of Health Promotion*, 08901171251326311.
- Shaikh, S. A., Alintakli, F., Mohamed, M., Mohammed, M., Khanam, R., & Shetty, P. J. (2024). Impact of sleep deprivation on stress levels and cognitive performance in young and middle-aged adults at a Medical University in Ajman, UAE. *Journal of Education and Health Promotion*, 13(1), 254.
- Tate, T., Main, L. C., Roberts, S., & Bruce, L. (2025). The Impact of Sleep on Cognitive Function in Youth Athletes. *Behavioral Sleep Medicine*, 1-13.