The International Journal of Indian Psychology
ISSN 2348-5396 (Online) | ISSN: 2349-3429 (Print)
Volume 12, Issue 2, April- June, 2024
DIP: 18.01.259.20241202, DOI: 10.25215/1202.259
https://www.ijip.in

Research Paper

The Role of Sleep Quality in Cognitive Failures and Decision Making

Ms. Annavarapu Gayathri Madhavi[1]*, Dr. Meenakshi Singh[2]

ABSTRACT

The study was conducted to examine the role of sleep quality in cognitive failures and decision-making. A total of 200 participants were taken into consideration (n=200), for the purpose of this study from Delhi NCR region between the age group 18- 35 years. They were surveyed using the Pittsburgh Sleep Quality Index (PSQI), Cognitive Failures Questionnaire 2.0, and Flinders decision-making questionnaire. The correlation analyses revealed significant associations between several sleep quality components and decision-making as well as cognitive failures. Notably, better overall sleep quality, as indicated by higher total sleep quality scores, was positively correlated with enhanced decision-making abilities and negatively correlated with cognitive failures. Some specific sleep quality dimensions, such as poor sleep efficiency, longer sleep latency, and shorter sleep duration, exhibited negative correlations with decision-making and positive correlations with cognitive failures. The regression analyses revealed that Daytime dysfunction and sleep duration emerged as significant positive predictors of decision-making performance.

Keywords: *Sleep Quality, Cognitive Failures, Decision Making*

Sleep quality is an important clinical construct, as it reflects the duration and quality of an individual's sleep. Research conducted thus far indicates that both the adequate duration and quality of sleep are essential for various cognitive functions, including executive attention, working memory, and higher cognitive abilities (Miller et al., 2014). Sleep quality, a multidimensional construct encompassing subjective estimates of sleep initiation, maintenance, adequacy, and refreshment upon awakening, is an essential component of health and well-being (Buysse et al., 1989). The assessment of sleep quality involves the examination of various aspects of the sleep experience, including sleep duration, sleep latency, number of awakenings, and subjective measures of sleep quality and vigor upon waking" (Krystal & Edinger, 2008). It is now widely recognized that sleep disturbances are associated with neurocognitive dysfunctions, attention deficits, impaired cognitive performance, depression, anxiety, stress, and poor impulse control (Killgore, 2010). Suboptimal sleep quality has been linked to cognitive impairments, mood disorders, and decreased productivity, emphasizing its critical role in daily functioning (Lim & Dinges, 2010).

[1]Student, Amity Institute of Psychology and Allied Sciences Amity University, Uttar Pradesh, Noida, India.
[2]Assistant Professor, Amity Institute of Psychology and Allied Sciences Amity University, Uttar Pradesh, Noida, India.
*Corresponding Author

Received: April 25, 2024; Revision Received: May 30, 2024; Accepted: June 03, 2024

The term ‘cognitive failures’ was given by Broadbent et al. (1982) to refer to minor slips that cause the normally smooth flow of intended action (physical or mental) to be disrupted. Even seemingly healthy individuals experience frustrating moments of cognitive lapses or "brain farts" on a regular basis. Common examples include entering a room only to forget the reason for going there, accidentally locking keys inside the car, or repeatedly trying to push a door open despite a clear "Pull" sign. Krueger (1989) examined the impact of sleep deprivation on performance and determined that it leads to reduced reaction times, decreased vigilance, heightened perceptual and cognitive distortions, and alterations in mood. Pilcher and Huffcutt (1996) demonstrated that the quality of sleep served as a significant predictor of cognitive failures, suggesting a direct correlation between poor sleep quality and heightened occurrences of cognitive lapses. Interestingly, cognitive failures do not necessarily correlate with overall cognitive functioning or intelligence.

Linde, L. (1992) stated that there is also evidence indicating that sleep deprivation can negatively impact several advanced cognitive functions, such as problem-solving, impulse control, and intricate decision-making processes. Decision-making is a ubiquitous aspect of human experience, influencing every facet of life, from mundane choices to life-altering decisions. Psychological research on decision-making encompasses a diverse array of theories, frameworks, and methodologies aimed at unraveling the cognitive, emotional, and social processes that underlie decision behavior. Recent studies indicate that after sleep deprivation, individuals may experience impairments in emotional decision-making, inhibitory control, mood regulation, moral judgment, and responses to frustration (Killgore et al. 2006).

REVIEW OF LITERATURE

Leng et al., (2024). This study investigates the association between objectively measured sleep duration and quality in midlife and cognitive performance assessed 11 years later among Black and White adults. Participants from the Coronary Artery Risk Development in Young Adults cohort study (n=526) underwent wrist actigraphy and completed the Pittsburgh Sleep Quality Index (PSQI) at baseline (2003-2005). Midlife cognition was evaluated in 2015-2016 using various tests. Multivariable logistic regression revealed that higher sleep fragmentation, but not sleep duration or subjective sleep quality, was associated with poor cognitive performance (>1 SD below the mean) on Digit Symbol Substitution Test (DSST), fluency, and Montreal Cognitive Assessment (MoCA). This association was consistent across race and sex, highlighting the importance of sleep quality for cognitive health in midlife.

Felicia, C., & Hawari, I. (2023). This study investigates the relationship between sleep quality and cognitive function among the Class of 2020-2021 Students of the Faculty of Medicine of Tarumanagara University during the COVID-19 pandemic. Using an analytical observational design with a cross-sectional analysis, data were collected online through the Pittsburgh Sleep Quality Index (PSQI) and Indonesian-language Montreal Cognitive Assessment (MoCA-INA) questionnaires from December 2021 to May 2022. Of the 249 respondents, 63.9% exhibited poor sleep quality. Poor sleep quality was more prevalent among respondents aged 20-22 years, females, those with a history of routine drug consumption, and those consuming.

Noor, M., & Ahmad, G. (2021). Sleep Quality, Decision Making, and Psychological Well-being among Auto-Drivers. This study in Lahore with 300 auto drivers found that poor sleep quality negatively affected decision-making and psychological well-being. Correlational

analysis revealed a negative relationship between poor sleep quality and decision-making, while decision-making positively correlated with psychological well-being. Addressing sleep quality is crucial for improving decision-making and psychological well-being among auto drivers and reducing the risk of road accidents.

METHODOLOGY

Aim

The present study aims to examine the influence of sleep quality in cognitive failures and decision-making.

Objective

The objective of the study is to understand the influence of sleep quality in cognitive failures among adults and to understand the effect of sleep quality in decision making among adults.

Hypothesis

1. Ho1 (null)- There will be no significant relationship between sleep quality and cognitive failures among adults.
2. H2 (alternative)- There will be a significant relationship between sleep quality and cognitive failures among adults.
3. Ho3 (null)- There will be no significant association between sleep quality and decision-making among adults.
4. H4 (alternative)- There will be a significant association between sleep quality and decision-making among adults.

Variables

Independent variable

- In the present study, the sleep quality of the individual is the independent variable.

Dependent variables

- The dependent variables in the study are cognitive failures and decision-making.

Sampling design

The proposed research will employ a sample size of (n=200) individuals with the mean $\bar{x}$ = 22 years and SD σ = 1.821. The data will be obtained through a simple random sampling technique. Simple random sampling is a probability-based sampling method that ensures each member of the target population has an equal chance of being selected for the study. This approach helps to minimize potential biases and increases the representativeness of the sample.

Inclusion Criteria:

1. Age: Adults between the ages of 18-35 years.
2. Education: Participants must have completed education up to 12th standard and should be familiar with the English language.
3. Demographic: Must be living in Delhi-NCR.

Exclusion Criteria:

1. Individuals who do not fall under the age criteria.
2. Those who are not living in Delhi- NCR.
3. Any neurological or psychiatric conditions that impact sleep quality, cognition and decision-making abilities.

Research Design/Method

The present study employs a quantitative research approach and a survey methodology to investigate the relationships between sleep quality, cognitive failures, and decision-making processes. A sample of 200 individuals will be selected through simple random sampling.

Various validated questionnaires and objective assessments will be used to measure sleep quality, cognitive failures, and decision-making abilities. The data collected through these instruments will undergo statistical analyses, including correlation analyzes to examine the strength and direction of relationships among the variables, and regression analyses to determine the predictive power of sleep quality on cognitive failures and decision-making outcomes. This quantitative approach, combined with robust statistical methods, aims to provide objective and reliable insights into the interplay between sleep quality, cognitive lapses, and decision-making processes.

Procedure Statistical Design

The current research employs correlation and regression analyses to fulfill the need to quantify the associations between sleep quality, cognitive failures, and decision-making processes, as well as to explore the predictive power of these relationships. Correlation analyses will assess the strength and direction of the linear relationships among the variables, while regression analyses will determine the extent to which variations in sleep quality can predict differences in cognitive failures and decision-making outcomes. Regression models will also enable the investigation of mediating and moderating effects, shedding light on the underlying mechanisms and potential influential factors. This combination of statistical techniques provides a comprehensive approach to address the research objectives, establishing associations, predictive power, and potential causal pathways involved in the interplay between sleep quality, cognitive functioning, and decision-making abilities.

Research Instruments/Tools

- **PSQI- Pittsburgh Sleep Quality Index**

PSQI is a questionnaire that has 19 self-report items. These assess sleep quality over a period of one month. Each item is categorized into seven subgroups, covering subjective assessment of sleep quality, time taken to fall asleep, duration of sleep, habitual efficiency of sleep, disturbances during sleep, use of sleep medication, and dysfunction experienced during daytime hours. Five additional questions rated by the respondent's roommate or bed partner are included for clinical purposes but are not scored. The content validity of PSQI was 0.905, which was greater than 0.90, indicating that the overall content validity of the PSQI was good. The overall internal consistency of the scale as a whole is good. The split-half reliability of the PSQI was good, and the item reliability index was 0.99.

- **Cognitive Failures Questionnaire 2.0**

CFQ 2.0 is an updated version of the original CFQ, designed to assess self-reported lapses in perception, memory, and motor function in daily life. It consists of a single factor with 15 items measuring from zero (very rarely) to four (very often) CFQ 2.0 demonstrated good test-retest reliability. Items include questions such as “Do you fail to listen to people speaking to you when you are doing something else?” and “Do you find you forget appointments?”.

- **Flinders decision-making questionnaire**

This is an instrument for measuring patterns of coping with decisional conflict consisting of 22 items answered on a three-point scale 0= not true, 1=sometimes true, 2=true for me. A confirmatory factor analysis found that the measure was compatible with four sub-dimensions namely vigilance, hyper-vigilance, buck-passing, and procrastination. Cronbach's alpha coefficient was found to be .82, .79, .77, and .75 respectively. MDMQ has proven to be a valid and reliable scale for measuring scale for determining the levels of decision-making.

RESULTS AND DISCUSSION

In this section, the data has been analyzed and interpreted to derive significant insights. The chapter outlines the employed data analysis methods, including statistical techniques, and illustrates the outcomes through suitable tables and corroborating evidence. The interpretation of the findings is elaborated, highlighting their pertinence to the research aims and existing literature.

This study aims to investigate how sleep quality affects cognitive failures and decision-making processes. By analyzing this relationship empirically, it seeks to uncover whether sleep disturbances exacerbate or mitigate lapses in Cognition. Additionally, the study aims to understand how sleep quality influences overall decision-making.

Descriptive Statistics

Table 1 Descriptive statistics of study variables

	Mean ($\bar{x}$)	**SD (σ)**
Subjective sleep quality	1.09	.79
Sleep latency	.59	1.05
Sleep duration	.88	.74
Sleep efficiency	.57	.75
Sleep disturbance	1.46	.67
Use of sleep medication	.20	.60
Daytime dysfunction	1.13	.82
Total sleep quality	5.95	2.74
Decision making	31.41	9.11
Cognitive failure	20.95	10.86

Table one represents the descriptive statistics (mean and standard deviation) of all the study variables – Total sleep quality (Subjective sleep quality, Sleep latency, Sleep duration, Sleep efficiency, Sleep disturbance, Use of sleep medication, Daytime dysfunction), Decision making, and Cognitive failure.

Correlation analysis

Table 2 Pearson's correlation between sleep quality (Subjective sleep quality, Sleep latency, Sleep duration, Sleep efficiency, Sleep disturbance, Use of sleep medication, Daytime dysfunction), Decision making, and Cognitive failure

	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Subjective sleep quality	-								
Sleep latency	.32**	-							
Sleep duration	.08	-.09	-						
Sleep efficiency	-.07	.05	.14*	-					
Sleep disturbance	.42**	.25**	.04	-.09	-				
Use of sleep medication	.06	-.05	.07	.06	.21**	-			
Daytime dysfunction	.45**	.28**	-.04	-.02	.35**	.10	-		
Total sleep quality	.66**	.60**	.31**	.29**	.60**	.33**	.62**	-	
Decision making	.16*	-.05	.16*	.01	.16*	-.05	.19**	.16*	-
Cognitive failure	.37**	.11	.03	-.05	.38**	.23**	.34**	.39**	.26**

***Correlation is significant at 0.01 level* *significant at 0.05 level ($p<0.05$)

Table two represents the coefficient of correlation between Total sleep quality (Subjective sleep quality, Sleep latency, Sleep duration, Sleep efficiency, Sleep disturbance, Use of sleep medication, Daytime dysfunction), Decision making, and Cognitive failure.

- The correlation between Decision making and Total sleep quality was significant and positive.
- The correlation between Decision-making and Subjective sleep quality was significant and positive
- The correlation between Decision making and Sleep latency was not significant and negative
- The correlation between Decision making and Sleep duration was significant and positive
- The correlation between Decision making and Sleep efficiency was not significant and positive
- The correlation between Decision making and Sleep disturbance was significant and positive
- The correlation between Decision-making and the Use of sleep medication was not significant and negative
- The correlation between Decision making and Daytime dysfunction was significant and positive

- The correlation between Cognitive failure and Total sleep quality was significant and positive
- The correlation between Cognitive failure and Subjective sleep quality was significant and positive
- The correlation between Cognitive failure and Sleep latency was not significant and positive
- The correlation between Cognitive failure and Sleep duration was not significant and positive
- The correlation between Cognitive failure and Sleep efficiency was significant and negative
- The correlation between Cognitive failure and Sleep disturbance was significant and positive
- The correlation between Cognitive failure and Use of sleep medication was significant and positive
- The correlation between Cognitive failure and Daytime dysfunction was significant and positive
- The correlation between Cognitive failure and Decision making was significant and positive.

Linear Regression Analysis

Table 3 Linear regression table with Daytime dysfunction and sleep as predictors of decision-making

Predictors	**Criterion: decision making**								
	B	**S.E.**	**β**	**t**	**R**	**R^2**	**Adj. R^2**	**α**	**F**
Daytime dysfunction	2.19	.79	.19	2.77**	.25	.06	.05	27.07	6.38**
Sleep duration	2.08	.87	.17	2.38*					

***significant at 0.01 level (p<0.01) *significant at 0.05 level (p<0.05)*

Table three represents the stepwise linear regression with Daytime dysfunction and sleep duration as predictors of decision-making while excluding all other variables. Daytime dysfunction and sleep duration explained about 6% of the positive variance in decision-making.

Table 4 linear regression table with Daytime dysfunction and sleep as predictors of Cognitive failures

Predictors	**Criterion: Cognitive failure**								
	B	**S.E.**	**β**	**t**	**R**	**R^2**	**Adj. R^2**	**α**	**F**
Total sleep quality	2.815	.37	.71	7.48**	.50	.25	.23	10.31	15.22**
Sleep efficiency	-3.16	.98	-.22	3.22**					
Sleep latency	-3.29	.90	-.32	3.65**					
Sleep duration	-2.66	1.06	-.18	2.50*					

***significant at 0.01 level (p<0.01) *significant at 0.05 level (p<0.05)*

Table four represents the stepwise linear regression with Total sleep quality, Sleep efficiency, Sleep latency, and Sleep duration as predictors of cognitive failure while excluding all other variables. Total sleep quality, Sleep efficiency, Sleep latency, and Sleep duration explained about 25% of the positive, negative, negative, and negative variance on cognitive failure respectively.

Descriptive statistics offer a summary of the variables under study, providing an overview of their characteristics. The mean values and standard deviations indicate the central tendency and variability of the data. For instance, the mean score for subjective sleep quality was relatively low (1.09 on a scale of 4), suggesting poorer sleep quality in the sample. Similarly, the mean score for cognitive failures (20.95) was notably high, indicating a higher propensity for cognitive lapses in the sample.

Correlation Analysis:

Pearson's correlation analysis revealed several significant relationships between the variables of interest.

- Decision-making was positively correlated with total sleep quality, subjective sleep quality, sleep duration, sleep disturbance, and daytime dysfunction. This suggests that better sleep quality is associated with enhanced decision-making abilities.
- Cognitive failures were positively correlated with total sleep quality, subjective sleep quality, sleep disturbance, use of sleep medication, and daytime dysfunction, as various aspects of sleep quality and habits worsen, cognitive failures tend to increase. However, cognitive failures were negatively correlated with sleep efficiency, indicating that poorer sleep efficiency is linked to increased cognitive failures.
- The positive correlation between decision-making and cognitive failures suggests that individuals with a higher propensity for cognitive failures may also experience impairments in decision-making processes.

Linear Regression Analysis:

The linear regression analyses aimed to identify the predictors of decision-making and cognitive failures among the sleep quality variables.

- For decision-making, the regression model revealed that daytime dysfunction and sleep duration were significant positive predictors, accounting for approximately 6% of the variance in decision-making scores. Higher levels of daytime dysfunction and longer sleep duration were associated with better decision-making abilities.
- For cognitive failures, the regression model indicated that total sleep quality, sleep efficiency, sleep latency, and sleep duration were significant predictors, collectively explaining approximately 25% of the variance in cognitive failure scores. Higher total sleep quality was associated with fewer cognitive failures, while poorer sleep efficiency, longer sleep latency, and shorter sleep duration were linked to increased cognitive failures.

The regression analyses highlight the differential influences of various sleep quality components on decision-making and cognitive failures. While daytime dysfunction and sleep duration emerged as predictors of decision-making, total sleep quality, sleep efficiency, sleep latency, and sleep duration collectively predicted cognitive failures.

Impairments in specific aspects of sleep, such as sleep efficiency, sleep latency, and sleep duration, may contribute to increased cognitive failures, which in turn can impact decision-

making abilities. Conversely, better overall sleep quality, particularly subjective sleep quality, and less daytime dysfunction may facilitate enhanced decision-making capabilities.

CONCLUSION

In conclusion, this study highlights the crucial role of sleep quality in cognitive functioning and decision-making abilities. Correlation analyses revealed significant associations between poor sleep quality and increased cognitive failures, as well as impaired decision-making. Regression analyses identified specific sleep quality components like daytime dysfunction, sleep duration, sleep efficiency, and sleep latency as predictors of decision-making performance and cognitive failures.

Notably, a positive correlation was found between cognitive failures and impaired decision-making, suggesting an interplay between these two domains. While the regression models explained a modest proportion of variance, the findings underscore the importance of sleep quality for optimal cognitive performance.

Further research is needed to explore additional factors and potential mediators/moderators that could provide a more comprehensive understanding of the relationships between sleep quality, cognitive lapses, and decision-making processes. Overall, this study contributes valuable insights into the complex interplay among these variables and highlights the need for interventions targeting both sleep quality and cognitive functioning.

REFERENCES

Buysse, D. J., Reynolds, C. F., Monk, T. H., Berman, S. R., & Kupfer, D. J. (1989). The Pittsburgh sleep quality index: A new instrument for psychiatric practice and research. Psychiatry Research, 28(2), 193–213. https://doi.org/10.1016/0165-1781(89)90047-4.

Felicia, C., & Hawari, I. (2023). The Correlation of Sleep Quality and Cognitive Function in Students of the Faculty Medicine during the Covid-19 Pandemic. Contagion, 5(1), 70. https://doi.org/10.30829/contagion.v5i1.14989

Leng, Y., Knutson, K. L., Carnethon, M. R., & Yaffe, K. (2024). Association between sleep quantity and quality in early adulthood with cognitive function in midlife. Neurology, 102(2). https://doi.org/10.1212/wnl.0000000000208056

Noor, M., & Ahmad, G. (2021). Sleep Quality, Decision Making and Psychological Well-being among Auto-Drivers. https://www.jpps.pk/index.php/journal/article/view/102

The psychology of judgment and decision making. (n.d.). https://psycnet.apa.org/record/1993-97429-000

Wang, L., Wu, Y., Lin, Y., Wang, L., Zeng, Z., Xie, X. S., Chen, Q., & Wei, S. (2022). Reliability and validity of the Pittsburgh Sleep Quality Index among frontline COVID-19 health care workers using classical test theory and item response theory. Journal of Clinical Sleep Medicine, 18(2), 541–551. https://doi.org/10.5664/jcsm.9658

Acknowledgment

I am deeply grateful for the opportunity to undertake this research project, which has been a significant milestone in my academic journey. I owe a debt of gratitude to Dr. Ranjana Bhatia, my director, for entrusting me with this dissertation. Special thanks to my guide, Dr. Meenakshi Singh, whose unwavering support and guidance were invaluable in shaping the direction of this research. Her expertise and encouragement propelled me through the process, ensuring its successful completion. I am also thankful to my teachers, peers, and

family for their constant support and motivation. Their belief in my abilities has been a driving force throughout my educational journey. Lastly, I extend my heartfelt appreciation to my parents and brothers for their unwavering encouragement and emotional support, without which this dissertation would not have been possible.

Conflict of Interest

The author(s) declared no conflict of interest.

How to cite this article: Madhavi, A.G. & Singh, M. (2024). The Role of Sleep Quality in Cognitive Failures and Decision Making. *International Journal of Indian Psychology*, *12*(2), 2981-2990. DIP:18.01.259.20241202, DOI:10.25215/1202.259