

Muhamad Noor Mohamed . Raja Nurul Jannat Raja Hussain .
Mardiana Mazaulan . Noor Azila Azreen Md Radzi .
Nurul Ain Abu Kasim . Nur Hani Syazwani Bakri .
Umami Khaltum Mohd Mokhtar . Mohd Aizzat Adnan .

Editors

Proceedings of the 1st International Summit Conference on Exercise Science, Sports Management, Outdoor Recreation, and Physical Education, ExSPORT 2024, 28th - 29th August, Malaysia

*Exporting Research Insights to Practical Applications in Sports
Turning Challenges into Opportunities*

ORGANIZED BY



IN COLLABORATION



SUPPORTED BY



The Effect of Sleep Quality on Cognitive Functions Among Young Adult in UiTM Seremban 3



Nurun Naja, Nur Najihah, Naimi Sahira, Muhammad Taufiq, Muhammad Akif and Sharifah Maimunah Syed Mud Puad*.

Abstract | Both physiological and psychological processes are improved by having good sleep quality. Though good sleep is crucial, young people frequently struggle with it as a result of the modern lifestyle. The objective of this study is to identify the sleep quality, level of cognitive function and whether sleep quality influences cognitive functions among young adults in UiTM Seremban 3. A total of 27 students from UiTM Seremban 3 were selected, and the data were collected over 7 days using protocol testing by [3] Accelerometers were used to assess participants' sleep quality, while N-Back tasks for working memory and Wisconsin Card Sorting Test (WCST) for executive function were used to assess the cognitive function of participants. Linear regression was used to analyse the correlation between sleep quality, working memory, and executive function. Reports from 26 young adults in UiTM Seremban 3 (22.3 ± 1.04 years) indicate a higher prevalence of moderate sleep quality (6.13 ± 1.044) and cognitive function for N-Back Test (78.3 ± 4.22) and WCST (-0.236 ± 0.4559). The findings show that the correlation between sleep quality and working memory is a significant correlation ($\beta = 0.540$; $p = 0.030$), while the correlation between sleep quality and executive function shows no significant correlation ($\beta = 0.120$; $p = 0.097$). These findings demonstrated sufficient evidence that sleep quality affects working memory ($p < 0.05$) but not executive function. Hence, sleep quality is associated with better cognitive performance of working memory in young adults.

Keywords: *Sleep quality, cognitive function, working memory, executive function, young adult, accelerometer.*

N., Naja, N., Najihah, N., Sahira, M., Taufiq, M., Akif, and S.M., Syed Mud Puad* (✉).

Faculty of Sports Science and Recreation, Universiti Teknologi MARA Negeri Sembilan Branch, Seremban Campus, Malaysia.

*Corresponding author: shari0971@uitm.edu.my

I. INTRODUCTION

Sleep is essential during the whole life cycle, especially for those young adults, who are in a formative period of growth. Other than that, getting enough sleep is essential for memory consolidation [6]. The majority of studies back up the assumption that sleep is essential for maintaining cognitive capacities like memory, concentration, and problem-solving skills. However, poor sleep quality and sleep deprivation have been reported among young adults due to the modern lifestyle and 24-hour culture of connectivity and media consumption [4]. College offers a level of personal freedom that many young people have never known before. Many college students prefer to have irregular sleep patterns, maybe as a result of social and academic schedules [5]. Also, media usage (e.g., smartphone addiction, lying posture, midnight use, screen time), coffee, and stimulant use all had a negative impact on sleep [8]. In addition, the main purpose presented in this paper was to investigate the effect of sleep quality on cognitive function among the young adult population.

II. METHODS

This study involved a total of twenty-seven ($N = 27$) students from UiTM Seremban 3, age (22.3 ± 1.04) years old. All the subjects were physically healthy and showed no signs of any chronic disease and were confirmed by a medical doctor. Before the study started, a consent form was given to each participant, and they were thoroughly informed about the study's purpose, testing procedures, associated risks, and benefits for participating. Every procedure was approved by the institution's ethics committee. Every questionnaire was completed by participants.

A. *Assessment of Sleep Quality*

Accelerometer was used to measure sleep quality. They function by tracking the body's motions during the night and offering information into sleep/wake patterns, sleep duration, and efficiency. They are also able to measure the frequency and intensity of the movements as you sleep. The accelerometer will record the bedtime, wake-up time, total sleep time (TST), and sleep efficiency (defined as $TST/\text{time in bed} \times 100$) of each participant [3]. All participants wear the accelerometer on their waist for about 7 days without taking out the device for 24 hours (except while bathing).

B. *Assessment of Cognitive Functions*

All the cognitive function tests were conducted every night at 10 p.m. until 12 a.m. Participants answered the test within the time given. The N-Back tests were given to the participants in order to assess their working memory. The N-Back test is a computer software test in which participants must respond to prior stimulus numbers (0-Back, 1-Back, and 2-Back conditions) while continuously updating their mental set [7]. This test comprised 25 trials. To complete the test, participants had to keep an eye on a sequence of numerical stimuli and determine when a given number was identical to one that had already been presented [3]. Performance was measured as %correct ($2\text{-back test} = \frac{\text{the number correct}}{25} \times 100$).

The Wisconsin Sorting Card Test (WSCT) was used to measure executive functions such as the ability to change cognitive strategies in a changing environment. WCST is a computer software test that requires participants to correctly match each response card with one of four stimulus cards using the feedback that was given (right or incorrect) [7].

C. Statistical Analysis

Jamovi 2.3.28 was used for statistical analysis. All results are presented as mean \pm SD. The level of sleep quality and cognitive function were performed using descriptive analysis, while the effect of sleep quality on cognitive function was investigated using linear regression analysis. A level of $p < 0.05$ was decided by considering statistical significance for linear regression.

III. RESULTS AND DISCUSSION

Based on Table 1, linear regression analysis showed sleep quality was significantly correlated with working memory test ($\beta = 0.540$; $p = 0.030$), but sleep quality was not significantly correlated with executive function because the p value is more than 0.05. Next, figure 1 shows an example of a scatter plot that illustrates the correlation between the outcomes of the N-Back test and sleep quality.

TABLE 1
CORRELATION OF SLEEP QUALITY AND COGNITIVE FUNCTIONS

	Sleep Quality	
	β	P
N-Back score	0.540	0.003*
West Score	0.120	0.097

Note: *= show significant, $p < 0.05$

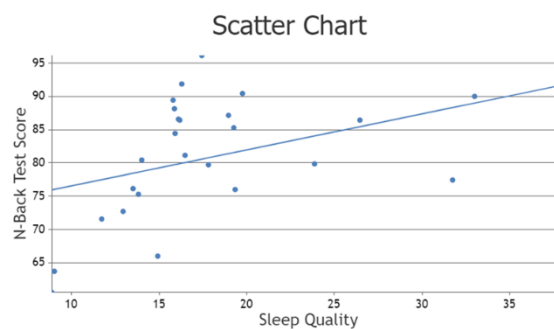


Fig. 1: Scatter Plot of Sleep Quality and Working Memory

This study's findings, which show a connection between working memory and sleep quality, largely match those of other research in this area of study [7]. Sleep quality had an impact on the performance of N-back activities since the test load developed from 1-Back to the 2-back condition and

increased mental effort [2]. Moreover, sleep duration may affect these outcomes when the test load was difficult [3]. Furthermore, according to a past study [4] participants' working memory declines as a result of their complete lack of sleep. However, executive function is not impacted by the quality of sleep. The findings of this study contradict those of multiple other studies that suggest that the quantity and quality of sleep has effect on executive function. Other past studies stated that other factors like education play a more significant role [1].

IV. CONCLUSIONS

The quality of sleep was found to be strongly correlated with working memory but not with executive function. Our results suggest that sleep plays a significant role in developing the greatest potential cognitive performance in working memory, which is crucial for young adults. In addition, a greater understanding of the significance of sleep could help in the early detection and management of issues to prevent more serious outcomes.

ACKNOWLEDGMENT: I would like to express my deepest gratitude to my supervisor, Puan Sharifah Maimunah binti Syed Mud Puad, for her constant encouragement and guidance throughout the completion of my research project. I also want to express my gratitude to the other members of the research team for working together to collect the data. Additionally, I would like to thank the UiTM Seremban 3 students for their involvement and participation in the research. Last but not least, I would like to express my sincere thanks to my family, especially to my parents, for their continuous sacrifices, support, and encouragement throughout this research project.

REFERENCES

- [1] M. Banno, T. Koide, B. Aleksic, T. Okada, T. Kikuchi, K. Kohmura, and N. Ozaki, "Wisconsin Card Sorting Test scores and clinical and sociodemographic correlates in Schizophrenia: multiple logistic regression analysis," *BMJ Open*, vol. 6, no. 6, 2012.
- [2] E. S. Bruce, L. Lunt, and J. E. McDonagh, "Sleep in adolescents and young adults," *Clinical Medicine*, vol. 17, no. 5, pp. 424, 2017.
- [3] K. Kato, K. Iwamoto, N. Kawano, Y. Noda, N. Ozaki, and A. Noda, "Differential effects of physical activity and sleep duration on cognitive function in young adults," *Journal of Sport and Health Science*, vol. 7, no. 2, pp. 227-236, 2018.
- [4] Y. Ma, L. Liang, F. Zheng, L. Shi, B. Zhong, and W. Xie, "Association between sleep duration and cognitive decline," *JAMA Network Open*, vol. 3, no. 9, 2020.
- [5] J. J. Pilcher, D. R. Ginter, and B. Sadowsky, "Sleep quality versus sleep quantity: Relationships between sleep and measures of health, well-being and sleepiness in college students," *Journal of Psychosomatic Research*, vol. 42, no. 6, 1997.
- [6] N. Z. M. Saat, S. A. Hanawi, K. S. Chan, H. Hanafiah, S. C. 206he, S. R. Aznan, and Z. H. Zulkefli, "Sleep quality among university students: associations between demographic factor and physical activity level," *International Journal of Pharmaceutical Research and Allied Sciences*, vol. 9, no. 3, 2020.
- [7] S. M. Syed Zubir, S. M. Syed Mud Puad, N. A. Abu Kassim, and Y. Md Yusoff, "The effect of sleep quality on cognitive function among Ipoh young adults," *Malaysian Journal of Sport Science and Recreation (MJSSR)*, vol. 19, no. 2, pp. 333-340, 2023.
- [8] X. Wu, S. Tao, Y. Zhang, S. Zhang, and F. Tao, "Low physical activity and high screen time can increase the risks of mental health problems and poor sleep quality among Chinese college students," *PLOS ONE*, vol. 10, no. 3, 2015.