Jurnal Sains Sukan dan Pendidikan Jasmani Jilid 14, Isu 2, 2025 (9-17)
ISSN: 2232-1918 / eISSN: 2600-9323
https://ejournal.upsi.edu.my/journal/JSSPJ

SLEEP QUALITY AND ATHLETIC PERFORMANCE: BEHAVIORAL INSIGHTS FROM UNIVERSITY STUDENT ATHLETES

Nur Izzati Mohd Nazim, Ahmad Fikri Mohd Kassim*, Zulkifli Ismail & Nur Amirah Zaker

Faculty of Sports Science and Recreation, Universiti Teknologi MARA, Cawangan Perlis, Kampus Arau, 02600 Arau, Perlis, Malaysia

***Corresponding Author:** ahmadfikri@uitm.edu.my

Received: 25 Mei 2024; **Revised**: 20 September 2025 **Accepted:** 17 Oktober 2025; **Published:** 28 Oktober 2025

To cite this article (APA): Mohd Nazim, N. I., Mohd Kassim, A. F., Ismail, Z., & Zaker, N. A. (2025). Sleep Quality and Athletic Performance: Behavioral Insights from University Student Athletes. *Jurnal Sains Sukan & Pendidikan Jasmani*, *14*(2), 9-17. https://doi.org/10.37134/jsspj.vol14.2.2.2025

To link to this article: https://doi.org/10.37134/jsspj.vol14.2.1.2025

ABSTRACT

Sleep quality plays a critical role in athletes' physical and mental recovery, significantly influencing their performance and overall well-being. While extensive research has examined sleep within the general population, a gap remains in understanding the specific effects of sleep quality and behaviours on university athletes facing unique stressors and demands. This study investigated the impact of sleep quality and behaviours among student-athletes enrolled at three public universities in northern Malaysia. Employing the Pittsburgh Sleep Quality Index (PSQI) and the Athlete Sleep Behavior Questionnaire (ASBQ), the research assessed multiple dimensions of sleep, including subjective sleep quality, sleep onset latency, sleep duration, sleep disturbances, sleep efficiency, use of sleep aids, daytime dysfunction, as well as habitual, environmental, behavioral, and sport-related factors. A total of 279 student-athletes were analysed using Spearman's rank correlation. Significant associations were identified between sleep quality and sleep behaviours, particularly linking subjective sleep quality with routine and behavioral factors. Results indicated a significant positive correlation between sleep quality and sleep behaviour ($r = 0.623$, $p < 0.05$), suggesting that poorer sleep quality is associated with more maladaptive sleep behaviours. The findings highlight the need for targeted interventions to enhance sleep health and athletic performance, emphasising the importance of comprehensive sleep hygiene practices. Such measures are essential for supporting the well-being and academic success of student-athletes. Furthermore, the study underscores the necessity for future research to explore gender-specific sleep interventions and the broader influence of environmental and behavioral determinants on sleep within athletic populations, to optimize both physical and mental health outcomes.

Keywords: Student-Athletes, Sleep Quality, Sleep Behaviors, Sport Performance, Student Well-Being

INTRODUCTION

Sleep quality encompasses an individual's satisfaction with their sleep experience, which is measured by aggregating their contentment with sleep duration, initiation, maintenance, and the restorative effects upon awakening (Lu et al., 2022). Sleep plays a crucial role in daily human functioning by supporting physical, cognitive, and psychological recovery. Conversely, poor sleep quality can impair both physical and psychological functioning, potentially worsening overall well-being. In this context, assessing sleep quality among athletes-particularly focusing on sleep duration and its impact on stress levels-is essential. Research by Lu et al. (2022) indicates that athletes who experience high-quality sleep recover more quickly both physically and emotionally. This recovery is especially important for

optimizing sports performance, restoring energy, managing illness, regulating metabolism, enhancing cognitive function, and promoting emotional well-being. Therefore, sleep quality is a pivotal factor in the recovery process and may enhance energy levels and confidence, thereby enabling athletes to perform at their best.

Sleep quality has both positive and negative effects on athletic performance. Improved sleep quantity and quality have been shown to enhance performance metrics. For example, Hamlin et al. (2021) reported that increasing sleep duration positively impacted athletes' performance. A study on the Stanford men's basketball team found that extending nightly sleep to 10 hours led to a 9% improvement in three-point shooting accuracy and increased court speed (Mah et al., 2011). In contrast, inadequate sleep quality limits the time available for bodily restoration, which can increase anxiety, stress, and underperformance. Studies by Hamilton et al. (2007) and Andrade et al. (2016) found that poor sleep quality before competitions heightened athletes' stress, tension, and anger, negatively affecting their performance.

Despite the critical role of sleep, research focusing on Malaysian university athletes remains limited. Recent studies show that Malaysian university students generally exhibit good sleep hygiene but still experience poor sleep quality, which correlates with increased anxiety and stress symptoms (Lim et al., 2024; Romdhani et al., 2023). Furthermore, a study on student athletes in Perak State Sports School found no significant differences in sleep behavior across gender, training frequency, or age, highlighting the need for localized research on sleep patterns and their impact on athletic performance (Ahmad et al., 2023). Given these findings, this study focuses on Malaysian university athletes to explore the relationship between sleep quality, sleep behaviors, and athletic performance within this specific population.

Thus, this study aims to examine the impact of sleep quality on the behavioral performance of student-athletes, a demographic that remains underexplored within the Malaysian research landscape. By focusing on university athletes as the primary subjects, the investigation seeks to elucidate the relationship between sleep quality, sleep behaviors, and athletic performance within this specific population. Given the unique physiological and psychological demands faced by student-athletes, understanding the interplay between sleep health and behavioral outcomes is crucial for optimizing both academic and athletic success. This research contributes to the growing body of literature on sports psychology and sleep studies by providing context-specific insights, thereby informing future interventions tailored to enhance sleep hygiene and performance among university athletes.

MATERIALS AND METHOD

Research Design

A quantitative cross-sectional research design was utilized to systematically investigate the association between sleep quality and sleep behavior among university student-athletes. This methodological approach enabled the collection of data at a single point in time, providing a comprehensive snapshot of sleep-related patterns and behaviors within the target population. By employing validated instruments, the study aimed to assess key dimensions of sleep and identify statistically significant relationships that may inform future interventions. Given the demanding nature of student-athlete schedules, this approach facilitated an efficient yet rigorous examination of sleep health, contributing to the broader understanding of factors influencing athletic and academic performance.

Participants

The sample size for this study was determined using the Krejcie and Morgan (1970) table, a widely recognized method for estimating appropriate sample sizes in quantitative research. A total of 279 student-athletes voluntarily participated, representing three public universities in the northern region of Malaysia: Universiti Teknologi MARA, Perlis Branch (UiTM Perlis), Universiti Utara Malaysia (UUM), and Universiti Malaysia Perlis (UNIMAP). The participants comprised both male and female student-athletes aged 18 years and above, reflecting a diverse cohort engaged in various competitive and recreational sports disciplines. To uphold ethical research practices, all participants provided

informed consent before data collection, ensuring voluntary participation and adherence to ethical guidelines for human research. This process safeguarded the integrity of the study, affirming compliance with principles of autonomy, confidentiality, and responsible academic inquiry.

Instrumentation

Pittsburgh Sleep Quality Index (PSQI)

Sleep quality was assessed using the Pittsburgh Sleep Quality Index (PSQI), developed by Buysse et al. (1988), a widely recognized and validated instrument for evaluating sleep patterns and disturbances. This questionnaire employs a Likert-scale format, with response options ranging from 0, indicating no difficulty, to 3, signifying severe difficulty. It comprises 19 items designed to measure various aspects of sleep, encompassing subjective sleep quality, sleep onset latency, total sleep duration, sleep efficiency, sleep disturbances, reliance on sleep medication, and daytime dysfunction.

The scale provides a comprehensive evaluation of sleep health, facilitating an understanding of both habitual sleep behaviors and potential disruptions that may affect overall well-being. Notably, the Cronbach's alpha coefficient for the PSQI in this study was reported at 0.65, reflecting a good level of internal consistency within the instrument. Higher scores indicate poorer sleep quality, highlighting the necessity for targeted interventions aimed at improving sleep hygiene, particularly within populations experiencing heightened psychological or physiological demands, such as student-athletes.

Given the significance of sleep in cognitive and physical recovery, the PSQI serves as a valuable tool in identifying individuals at risk of sleep disturbances, enabling researchers and practitioners to develop evidence-based strategies to enhance sleep health and optimize performance. Future studies may further refine their application by exploring gender-specific variations in sleep patterns and the interplay between environmental, behavioral, and physiological determinants influencing sleep quality.

Athlete Sleep Behaviour Questionnaire (ASBQ)

The 18-item self-reported Athlete Sleep Behavior Questionnaire (ASBQ), developed by Driller et al. (2018), was employed to screen athletes for potential sleep disorders and assess a range of sports-related, environmental, and behavioral factors influencing sleep quality. This questionnaire is structured as a Likert scale, with response options ranging from 1 ("never") to 5 ("always"), allowing for a nuanced evaluation of sleep behaviors and their frequency. Designed to capture both habitual sleep patterns and external influences within an athletic context, the ASBQ provides valuable insights into how various lifestyle, training, and competition-related elements may contribute to sleep disturbances or irregularities. The internal consistency of the instrument, as measured by Cronbach's alpha, was reported at 0.83, indicating a good level of reliability in assessing sleep-related behaviors among athletes. By incorporating this validated tool, the study offers a comprehensive approach to identifying sleep health challenges within university athletic populations, facilitating evidence-based strategies to improve recovery, well-being, and overall performance outcomes.

Procedures

Approval to conduct this study was obtained from the University Research Ethics Committee (REC-ERC/3/2024), ensuring compliance with ethical guidelines for research involving human participants. Before data collection, all participants were provided with an informed consent form, which outlined the voluntary nature of their involvement and their right to withdraw from the study at any time without consequences. This process upheld an ethical standard by protecting participant autonomy and ensuring transparency in research practices.

Data collection was conducted using structured, self-reported questionnaires distributed via Google Forms to participants who voluntarily chose to participate in the study. These questionnaires assessed both sleep quality and sleep behavior, enabling a comprehensive evaluation of the factors influencing student-athletes' sleep patterns. The online distribution method ensured accessibility and

efficiency in data collection, allowing responses to be gathered systematically across the targeted population.

Statistical Analysis

Data was analyzed using the Statistical Packages for Social Sciences (SPSS) version 29.0 (IBM Corp., Chicago, IL, USA). Descriptive statistics were reported as mean and standard deviation (SD). Spearman Rank Correlation was used to determine the relationship between sleep quality and sleep behaviour. The significance level was set at $p \leq .05$. All data calculated were presented in positive and negative relationships using Spearman Rank-Order Correlation Coefficients.

RESULT

Table 1 presents the descriptive statistics for age, sleep quality and sleep behavior. All the values are presented in mean and standard deviation.

Table 1. Descriptive Data of the Participants

Variables	Mean	Standard Deviation
Age	21.85	1.82
Subjective sleep quality	1.45	0.68
Sleep latency	1.36	0.68
Sleep duration	0.94	0.99
Sleep efficiency	2.36	0.24
Sleep disturbance	1.75	0.48
Use of sleep medication	0.25	0.58
Daytime dysfunction	1.58	0.70
Routine/environment factors	1.96	0.41
Behavioural factors	4.14	0.87
Sports related factors	2.24	0.36

Table 2. Interpretation Table of Spearman Rank-Order Correlation Coefficients

Spearman, p	Correlation
0.70	Very strong relationship
0.40 – 0.69	Strong relationship
0.30 – 0.39	Moderate relationship
0.20 – 0.29	Weak relationship
0.10 – 0.19	No or negligible relationship

This descriptor applies to both positive and negative relationships
(Adapted from Dancey and Reidy, 2004)

Table 3 presents the Spearman's rank correlation coefficients for the study variables at the relevant time points. The sleep quality component demonstrated an acceptable level of reliability, with a Cronbach's alpha of 1.00. Subjective Sleep Quality (SSQ) exhibited a weak yet statistically significant positive correlation with Routine and Environmental Factors (REF) ($r = 0.332$, $p < 0.01$) and Behavioural Factors (BF) ($r = 0.206$, $p < 0.01$). However, its correlation with Daytime Dysfunction (DD) ($r = 0.144$, $p < 0.05$) was negligible, as was its relationship with Sleep Latency (SL) ($r = 0.17$, $p > 0.05$). Sleep Latency (SL) demonstrated a strong positive correlation with Sports-Related Factors (SRF) ($r = 0.593$, $p < 0.01$), a moderate positive correlation with Behavioural Factors (BF) ($r = 0.321$, $p < 0.01$), and a negligible correlation with Sleep Disturbance (SDist) ($r = 0.198$, $p < 0.01$.

Sleep Duration (SDur) displayed a moderate positive correlation with Routine and Environmental Factors (REF) ($r = 0.419$, $p < 0.01$) and a weak negative correlation with Daytime Dysfunction (DD) ($r = -0.169$, $p < 0.01$). Sleep Efficiency (SE), however, showed no significant correlation with any other variables. Sleep Disturbance (SDist) was strongly positively correlated with Behavioural Factors (BF) ($r = 0.687$, $p < 0.01$) and Sports-Related Factors (SRF) ($r = 0.438$, $p < 0.01$), while demonstrating weak positive correlations with Daytime Dysfunction (DD) ($r = 0.240$, $p < 0.01$) and Routine and Environmental Factors (REF) ($r = 0.141$, $p < 0.05$). The Use of Sleep Medication (UFSM) exhibited a weak positive correlation with Behavioural Factors (BF) ($r = 0.289$, $p < 0.01$) and a negligible positive correlation with Routine and Environmental Factors (REF) ($r = 0.122$, $p < 0.05$). Daytime Dysfunction (DD) showed a strong positive correlation with Behavioural Factors (BF) ($r = 0.586$, $p < 0.01$) and weak positive correlations with Routine and Environmental Factors (REF) ($r = 0.353$, $p < 0.01$) and Sports-Related Factors (SRF) ($r = 0.124$, $p < 0.05$). Routine and Environmental Factors (REF) exhibited weak positive correlations with Behavioural Factors (BF) ($r = 0.353$, $p < 0.01$) and Sports-Related Factors (SRF) ($r = 0.204$, $p < 0.01$). Lastly, Behavioural Factors (BF) were found to have a strong positive correlation with Sports-Related Factors (SRF) ($r = 0.543$, $p < 0.01$).

Table 3. Spearman Rank-Order Correlation Coefficients

	SSQ	SL	SDur	SE	SDist	UFSM	DD	REF	BF	SRF
Subjective Sleep Quality	1.000									
Sleep Latency	0.17	1.000								
Sleep Duration	.013	-.061	1.000							
Sleep Efficiency	.000	.000	.000	1.000						
Sleep Disturbance	.081	.198**	-.104	.000	1.000					
Use of Sleep Medication	.025	-.074	.033	.000	.066	1.000				
Daytime Dysfunction	.144*	.072	-.169**	.000	.240**	.004	1.000			
Routine/ Environmental Factors	.332**	.150*	.419**	.000	.141*	.122*	.048	1.000		
Behavioural factors	.206**	.321**	-.007	.000	.687**	.289**	.586**	.353**	1.000	
Sports-Related Factors	.014	.593**	-.017	.000	.438**	-.046	.124*	.204**	.543**	1.000

Note: **Significance at $p < .01$: Correlation is significant at the 0.01 level (two-tailed).
*. Significance at $p < .05$: Correlation is significant at the 0.05 level (two-tailed)

DISCUSSION

The current research highlights the complex relationships among various sleep-related factors and their effects on sleep quality in university student-athletes. Findings indicate that subjective sleep quality (SSQ) is positively correlated with routine and environmental factors (REF) and behavioral factors (BF), emphasizing the importance of regular sleep routines and specific sleep-related behaviors in improving perceived sleep quality. These results align with the findings of Irish et al. (2015), who underscored the role of good sleep hygiene practices—such as maintaining a comfortable sleep environment and adhering to a consistent sleep schedule—in significantly enhancing sleep quality. This is particularly crucial for university athletes, who often face demanding schedules and physical exertion that disrupt their sleep cycles. According to Irish et al. (2015), maintaining sleep consistency and optimizing the sleep environment can mitigate these disruptions and promote restorative sleep.

Furthermore, the study's finding that sleep latency, or the time it takes to fall asleep, is strongly influenced by sports-related and behavioral factors suggests that physical activity and pre-sleep routines play essential roles in sleep initiation. This aligns with Sejbuk et al. (2022), who demonstrated that stimulating activities—such as intense exercise or excessive screen time—can negatively impact sleep quality before bedtime. Implementing relaxation techniques and limiting high-intensity activities before sleep may help athletes reduce sleep latency and improve overall sleep quality (Sejbuk et al., 2022). These strategies are especially critical for managing physiological arousal that may interfere with the body's natural sleep-inducing processes.

The association between sleep duration and routine and environmental factors underscores the necessity of a stable and supportive sleep environment for achieving optimal sleep duration. Establishing a consistent sleep schedule and maintaining a conducive sleep setting are essential for ensuring adequate rest, which is crucial for athletic recovery and performance. Hirshkowitz et al. (2015) emphasized that sufficient sleep duration is vital for physical health, cognitive function, and emotional well-being, making it particularly important for individuals engaging in rigorous physical activity, such as university athletes.

Additionally, the negative correlation between sleep duration and daytime dysfunction reinforces the importance of sufficient sleep for maintaining daytime cognitive and physical performance. Adequate sleep duration helps alleviate daytime fatigue and cognitive impairment, both of which can hinder academic achievement and athletic success among university students. This was supported by historical findings by Pilcher and Huffcutt (1996), who found that sleep deprivation significantly reduces cognitive performance, mood stability, and motor function—key factors for student-athlete success both in academic settings and competitive sports. Furthermore, recent research indicated that even a single night of sleep deprivation can substantially increase reaction time and impair cognitive functions such as executive functioning and memory, which are essential for both academic and athletic tasks (Skurvydas et al., 2020).

Sleep disturbances are strongly associated with behavioral and sports-related characteristics, indicating that an individual's actions and physical activity levels can significantly influence sleep interruptions. Findings from this research suggest that mitigating sleep disruptions may be effectively achieved by regulating pre-sleep behaviors and moderating physical exertion before bedtime. Additionally, the moderate correlation between sleep disturbances and daytime dysfunction implies that frequent sleep interruptions can negatively impact daily performance and alertness, reinforcing the importance of addressing sleep disturbances to enhance overall well-being.

Alhola and Polo-Kantola (2007) found that chronic sleep debt impairs neurobehavioral functioning and increases subjective drowsiness. This was further validated by recent research indicating that insomnia-related cognitive and behavioral factors—such as hyperarousal and poor sleep hygiene, substantially affect sleep quality and daily performance among adolescents with delayed sleep-wake phase disorder (Alnawwar et al., 2023). Moreover, Alnawwar et al. (2023) highlight that optimizing pre-sleep behaviors and moderating physical activities can significantly reduce sleep disturbances and improve daytime functioning. These findings reinforce the importance of addressing sleep-related behavioral and environmental factors to support overall health and cognitive performance.

The research also highlights the weak positive correlation between the use of sleep aids and behavioral, routine, and environmental factors. This suggests that individuals who rely on sleep medication may do so in response to poor sleep habits or unfavorable sleep environments. While sleep

aids can offer temporary relief, the findings underscore the necessity of addressing underlying behavioral and environmental factors to foster sustainable improvements in sleep quality. Rossman (2019) argued that cognitive-behavioral therapy for insomnia (CBT-I) is often more effective in the long term than pharmaceutical treatments, as it targets the root causes of sleep disturbances rather than merely alleviating symptoms.

Furthermore, the study identified a substantial correlation between routine and environmental characteristics and both behavioral and sports-related factors, indicating that a structured and supportive sleep environment can encourage healthier sleep habits and improve overall sleep quality. Drews et al. (2020) found that co-sleeping with a supportive partner can enhance sleep quality by synchronizing sleep architecture. Their findings revealed that individuals experience improved sleep quality when sharing a bed with their spouse, as sleep patterns exhibit enhanced synchronization among couples. This research underscores the influence of social and environmental factors on sleep health. However, individual traits and relationship dynamics may also affect sleep quality, highlighting the need for personalized interventions (Drews et al., 2020).

The relationship between behavioral and routine/environmental factors and daytime dysfunction underscores the necessity of maintaining consistent and effective sleep practices to preserve daytime alertness and cognitive functioning (Hosokawa et al., 2022). This reinforces the importance of comprehensive sleep hygiene strategies, including regulated sleep schedules, optimized sleep environments, and mindful pre-sleep activities, to ensure high-quality sleep and minimize daytime impairment. Drews et al. (2020) also established that poor sleep quality is strongly associated with diminished daytime performance, further emphasizing the need for maintaining effective sleep patterns to sustain peak functionality throughout the day.

Interestingly, the research revealed no significant correlation between subjective sleep quality and daytime dysfunction, suggesting that perceived sleep quality may not directly influence daytime alertness and cognitive performance in university athletes. This was implied that other factors, such as physical fatigue or stress levels, may play a more dominant role in daytime dysfunction within this demographic (Li et al., 2025). Similarly, Hamlin et al. (2021) observed that the absence of a relationship between sleep efficiency and any of the assessed components suggests that sleep efficiency—the ratio of time spent asleep to time spent in bed—may not be influenced by the same variables affecting other aspects of sleep quality and behavior. This highlights the multifaceted nature of sleep and suggests that multiple factors should be considered when addressing sleep challenges among university athletes. Overall, these findings provide compelling evidence that various aspects of sleep behavior and routine significantly impact sleep quality among university athletes. They emphasize the importance of adopting comprehensive sleep hygiene practices and fostering a supportive sleep environment to promote restorative sleep. These insights should guide future research and interventions aimed at improving sleep quality and overall well-being in this population.

CONCLUSION

In conclusion, this study has provided valuable insights into the relationships between sleep quality, sleep behavior, and demographic factors among university student-athletes. The findings highlight the importance of maintaining regular sleep routines, fostering a supportive sleep environment, and adopting behavioral modifications to enhance overall sleep quality. The structured and demanding lifestyles of athletes may also contribute to a degree of uniformity in sleep behaviors within this population. Practically, these results suggest that athletes should prioritize healthy sleep as part of training and recovery, while coaches and sports administrators are encouraged to integrate sleep education and targeted interventions into athletic programs. By addressing sleep health proactively, institutions can enhance athletic performance, resilience, and overall well-being. Future research may extend these findings by exploring differences across sports disciplines and demographic subgroups.

ACKNOWLEDGEMENTS

We extend our sincere gratitude to the student-athletes from three public universities in the northern region of Malaysia for their participation in this study. Their willingness to contribute their time and share their experiences has been invaluable in providing the data necessary for this research. Their cooperation and enthusiasm have significantly enriched the scope and depth of this study, making a meaningful contribution to the understanding of sleep quality and behaviors among university athletes.

REFERENCES

Ahmad, Z., & Zawi, M. K. (2022). Sleep Behavior Among Student Athletes. *Malaysian Journal of Social Sciences and Humanities* (MJSSH), 7(3), e001394. https://doi.org/10.47405/mjssh.v7i3.1394

Alhola, P., & Polo-Kantola, P. (2007). Sleep deprivation: Impact on cognitive performance. *Neuropsychiatric disease and treatment*, *3*(5), 553-567. https://doi.org/10.2147/ndt.s12160203

Alnawwar M A, Alraddadi M I, Algethmi R A, et al. (2023). The Effect of Physical Activity on Sleep Quality and Sleep Disorder: A Systematic Review. *Cureus* 15(8): e43595. https://doi.org/10.7759/cureus.43595

Andrade, A., Bevilacqua, G. G., Coimbra, D. R., Pereira, F. S., & Brandt, R. (2016). Sleep quality, mood and performance: a study of elite Brazilian volleyball athletes. *Journal of sports science & medicine,* 15(4), 601. https://pmc.ncbi.nlm.nih.gov/articles/PMC5131213/

Drews HJ, Wallot S, Brysch P,Berger-Johannsen H, Weinhold SL, Mitkidis P, Baier PC, Lechinger J, Roepstorff A and Göder R (2020). Bed-Sharing in Couples Is Associated With Increased and Stabilized REM Sleep and Sleep-Stage Synchronization. *Front. Psychiatry* 11, 583. https://doi.org/10.3389/fpsyt.2020.00583

Hamilton, N. A., Nelson, C. A., Stevens, N., & Kitzman, H. (2007). Sleep and psychological well-being. *Social Indicators Research*, *82*, 147-163. https://doi.org/10.1007/s11205-006-9030-1

Hamlin, M. J., Deuchrass, R. W., Olsen, P. D., Choukri, M. A., Marshall, H. C., Lizamore, C. A., & Elliot, C. A. (2021). The effect of sleep quality and quantity on athlete's health and perceived training quality. *Frontiers in Sports and Active Living*, *3*, 705650. https://doi.org/10.3389/fspor.2021.705650

Hirshkowitz, M., Whiton, K., Albert, S. M., Alessi, C., Bruni, O., DonCarlos, L., & Hillard, P. J. A. (2015). National Sleep Foundation's sleep time duration recommendations: methodology and results summary. *Sleep health*, *1*(1), 40-43. https://doi.org/10.1016/j.sleh.2014.12.010

Hosokawa, R., Tomozawa, R., Fujimoto, M., Anzai, S., Sato, M., Tazoe, H., & Katsura, T. (2022). Association between sleep habits and behavioral problems in early adolescence: a descriptive study. *BMC psychology*, *10*(1), 254. https://doi.org/10.1186/s40359-022-00958-7

Irish, L. A., Kline, C. E., Gunn, H. E., Buysse, D. J., & Hall, M. H. (2015). The role of sleep hygiene in promoting public health: A review of empirical evidence. *Sleep medicine reviews*, *22*, 23-36. https://doi.org/10.1016/j.smrv.2014.10.001

Li, H., Xiong, Y., Zhang, Q., Lu, Y., Chen, Q., Wu, S., Deng, Y., Yang, C., Knobf, M. T., & Ye, Z. (2025). The interplay between sleep and cancer-related fatigue in breast cancer: A casual and computer-simulated network analysis. *Asia-Pacific Journal of Oncology Nursing*, *12*. https://doi.org/10.1016/j.apjon.2025.100692

Lim, J. K. E. (2024). The Relationship between Sleep Quality and Depression among Undergraduate Students in Universities Across Malaysia [Unpublished master's thesis]. Tunku Abdul Rahman University College. https://eprints.tarc.edu.my/29768/

Liu, J., Magielski, J., Glenn, A., & Raine, A. (2022). The bidirectional relationship between sleep and externalizing behavior: a systematic review. *Sleep epidemiology*, *2*, 100039. https://doi.org/10.1016/j.sleepe.2022.100039

Lu, J., An, Y., & Qiu, J. (2022). Relationship between sleep quality, mood state, and performance of elite air-rifle shooters. *BMC Sports Science, Medicine and Rehabilitation*, 14(1), 32. https://doi.org/10.1186/s13102-022-00424-2

Mah, C. D., Mah, K. E., Kezirian, E. J., & Dement, W. C. (2011). The effects of sleep extension on the athletic performance of collegiate basketball players. *Sleep*, 34(7), 943-950. https://doi.org/10.5665/SLEEP.1132

Ong, S. C., Azman, N., & Ho, H. T. (2023). Factors Associated With Sleeping Quality and Behaviors Among University Students in Malaysia. *Sleep Medicine Research*, 14(1), 43-49. https://doi.org/10.17241/smr.2022.0153 6

Pilcher, J. J., & Huffcutt, A. I. (1996). Effects of sleep deprivation on performance: a meta-analysis. *Sleep*, 19(4), 318-326. https://doi.org/10.1093/sleep/19.4.318

Rossman, J. (2019). Cognitive-behavioral therapy for insomnia: an effective and underutilized treatment for insomnia. *American journal of lifestyle medicine*, *13*(6), 544-547. https://doi.org/10.1177/1559827619867677

Sejbuk, M., Mirończuk-Chodakowska, I., & Witkowska, A. M. (2022). Sleep quality: a narrative review on nutrition, stimulants, and physical activity as important factors. *Nutrients*, *14*(9), 1912. https://doi.org/10.3390/nu14091912

Skurvydas, A., Zlibinaite, L., Solianik, R., Brazaitis, M., Valanciene, D., Baranauskiene, N., & Kamandulis, S. (2020). One night of sleep deprivation impairs executive function but does not affect psychomotor or motor performance. *Biology of sport*, *37*(1), 7-14. https://doi.org/10.5114/biolsport.2020.89936