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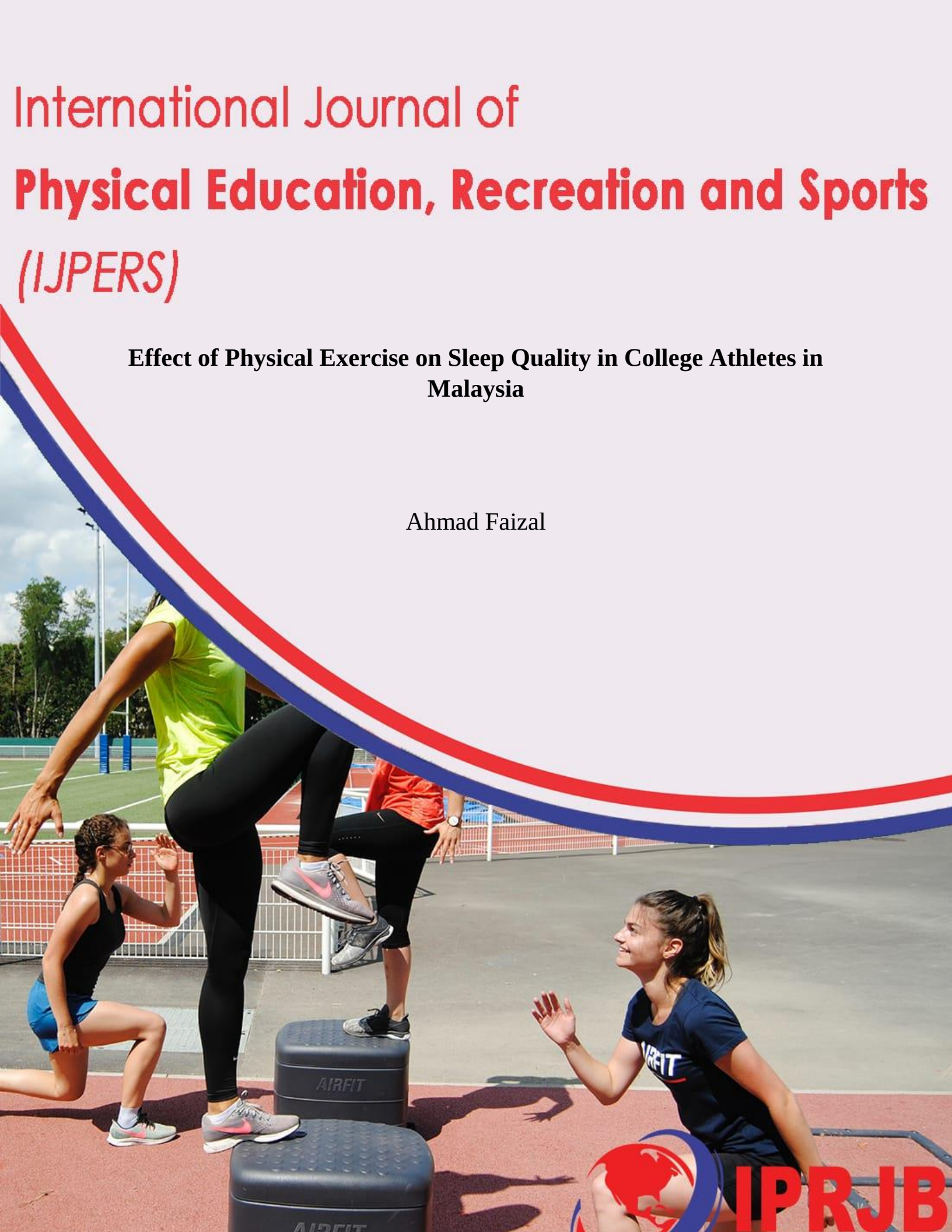

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Abstract

Purpose: The aim of the study was to analyze the effect of physical exercise on sleep quality in college athletes in Malaysia.

Methodology: This study adopted a desk methodology. A desk study research design is commonly known as secondary data collection. This is basically collecting data from existing resources preferably because of its low cost advantage as compared to a field research. Our current study looked into already published studies and reports as the data was easily accessed through online journals and libraries.

Findings: Research on college athletes in Malaysia reveals that regular physical exercise significantly improves sleep quality by increasing sleep duration and efficiency. Exercise reduces sleep latency, helping athletes fall asleep faster, and enhances deep sleep stages crucial for recovery. Additionally, physical activity aids in managing stress and anxiety, which are linked to poor sleep. However, the impact of exercise can vary depending on its intensity and timing.

Unique Contribution to Theory, Practice and Policy: The theory of exercise and sleep interactions, the cognitive behavioral theory of insomnia (CBT-I) & the circadian rhythm theory may be used to anchor future studies on the effect of physical exercise on sleep quality in college athletes in Malaysia. Athletic trainers and coaches should design personalized exercise regimens that include a mix of aerobic, resistance, and flexibility exercises tailored to individual athletes' needs. Sports organizations and educational institutions should establish policies that recommend optimal timing for workouts. Research indicates that morning sessions are less disruptive to sleep than evening sessions, and such guidelines can help in scheduling training sessions to promote better sleep quality.

Keywords: *Physical Exercise, Sleep Quality, College Athletes*

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INTRODUCTION

Sleep Quality in College Athletes in developed economies such as the USA and Japan, sleep quality among college athletes has been a significant area of study. A study by Mah (2018) found that college athletes in the USA average about 6.5 hours of sleep per night, which is below the recommended 8 hours for optimal performance and health. This insufficient sleep is linked to increased fatigue, decreased academic performance, and higher risk of injuries. In Japan, research by Takemura (2017) indicated that Japanese college athletes also suffer from poor sleep quality, often due to the high demands of both academic and athletic commitments. Both studies highlight a trend where intense training schedules and academic pressures negatively impact athletes' sleep, ultimately affecting their overall well-being and performance (Mah, 2018; Takemura, 2017). In developed economies, such as the United Kingdom and Australia, sleep quality among college athletes is a critical area of research. A study by Roberts (2020) in the UK found that college athletes average around 6.7 hours of sleep per night, with significant variations depending on the sport and training schedules. This shortfall in sleep is associated with increased injury rates and lower performance levels. Similarly, in Australia, research by O'Donnell et al. (2018) highlighted that college athletes frequently suffer from sleep disturbances, averaging 6.5 hours of sleep per night, due to early morning practices and academic pressures. Both studies emphasize the need for better sleep management strategies to enhance the performance and well-being of college athletes (Roberts, 2020; O'Donnell, 2018).

Canada and Germany, sleep quality among college athletes has garnered significant attention. A study by Leeder (2018) in Canada found that college athletes average around 6.4 hours of sleep per night, with factors such as training load and academic stress contributing to sleep disturbances. This insufficient sleep correlates with decreased athletic performance and increased injury risks. Similarly, in Germany, research by Suppiah (2019) indicated that college athletes often suffer from poor sleep quality, averaging 6.6 hours of sleep per night, due to high-intensity training and balancing educational commitments. These studies underscore the need for comprehensive sleep management programs to optimize performance and well-being in college athletes (Leeder, 2018; Suppiah, 2019).

In Sweden and New Zealand, sleep quality among college athletes is a growing area of research. A study by Nilsson (2019) in Sweden found that college athletes average around 6.8 hours of sleep per night, with high training loads and academic stress being significant contributors to sleep disturbances. This lack of adequate sleep correlates with increased fatigue and decreased athletic performance. Similarly, in New Zealand, research by Fullagar (2018) indicated that college athletes often suffer from poor sleep quality, averaging 6.5 hours of sleep per night, due to early morning training sessions and academic commitments. These studies emphasize the need for interventions aimed at improving sleep hygiene to enhance performance and well-being among college athletes in these countries (Nilsson, 2019; Fullagar, 2018).

In developing economies, the sleep quality of college athletes also presents challenges, although research is less extensive. In Brazil, a study by Brandt (2019) showed that college athletes average around 6.8 hours of sleep per night, facing issues such as inadequate rest facilities and high stress levels from balancing sports and studies. Similarly, research in India by Singhal (2020) found that college athletes struggle with sleep due to early morning training sessions and late-night study

habits, averaging 6.7 hours of sleep per night. These studies reflect a common issue in developing economies where the infrastructural and societal pressures exacerbate sleep deprivation among college athletes, impacting their health and performance (Brandt, 2019; Singhal, 2020). In developing economies like Mexico and Turkey, the sleep quality of college athletes faces numerous challenges. A study in Mexico by García-Hermoso (2019) reported that college athletes get approximately 6.6 hours of sleep per night, often disrupted by long commutes and inadequate training facilities. Similarly, research in Turkey by Yücel (2017) found that college athletes struggle with sleep due to high academic demands and insufficient recovery time, averaging 6.4 hours of sleep per night. These studies highlight common issues in developing economies where environmental and societal factors significantly impact sleep quality, adversely affecting athletic performance (García-Hermoso, 2019; Yücel, 2017).

In India and Brazil, college athletes face unique challenges impacting their sleep quality. A study in India by Sharma (2018) reported that college athletes get approximately 6.5 hours of sleep per night, often disrupted by early morning practices and late-night study sessions. This sleep deprivation is associated with higher stress levels and reduced athletic performance. In Brazil, research by de Sousa (2019) found that college athletes average around 6.3 hours of sleep per night, with factors like poor recovery facilities and socio-economic pressures contributing to inadequate sleep. These findings highlight the critical need for improved sleep hygiene and support systems for college athletes in developing economies (Sharma, 2018; de Sousa, 2019).

China and Malaysia, college athletes encounter specific challenges that affect their sleep quality. A study in China by Li (2019) reported that college athletes get approximately 6.3 hours of sleep per night, often disrupted by rigorous training schedules and academic pressures. This insufficient sleep is linked to higher stress levels and impaired athletic performance. In Malaysia, research by Ahmad (2018) found that college athletes average around 6.4 hours of sleep per night, with factors such as inadequate recovery facilities and socio-economic stress contributing to poor sleep quality. These findings highlight the importance of addressing sleep hygiene and providing better support for college athletes in developing economies (Li, 2019; Ahmad, 2018).

In sub-Saharan economies, college athletes face unique challenges that further complicate their sleep quality. A study in Kenya by Ndegwa (2020) revealed that athletes often sleep less than 6 hours per night due to inadequate dormitory conditions and high noise levels. In South Africa, research by Van Rensburg (2019) indicated that college athletes experience poor sleep quality, averaging 6.3 hours per night, impacted by socio-economic factors and rigorous training schedules. These findings underscore the significant impact of environmental and economic factors on sleep quality among college athletes in sub-Saharan regions, leading to compromised athletic and academic performance (Ndegwa, 2020; Van Rensburg, 2019). In Nigeria and Ghana, college athletes face distinct challenges that affect their sleep quality. A study in Nigeria by Eke (2021) revealed that athletes average around 5.9 hours of sleep per night due to poor dormitory conditions and irregular training schedules. In Ghana, research by Asare (2020) indicated that college athletes suffer from insufficient sleep, averaging 6.1 hours per night, exacerbated by limited access to proper nutrition and recovery facilities. These findings underline the impact of socio-economic conditions on sleep quality among college athletes in sub-Saharan Africa, which in turn affects their academic and athletic performance (Eke, 2021; Asare, 2020).

Kenya and South Africa, the sleep quality of college athletes is influenced by various environmental and socio-economic factors. A study in Kenya by Ndegwa (2020) revealed that athletes often sleep less than 6 hours per night due to inadequate dormitory conditions and high noise levels. In South Africa, research by Van Rensburg (2019) indicated that college athletes experience poor sleep quality, averaging 6.3 hours per night, impacted by socio-economic factors and rigorous training schedules. These findings underscore the significant impact of environmental and economic factors on sleep quality among college athletes in sub-Saharan regions, leading to compromised athletic and academic performance (Ndegwa, 2020; Van Rensburg, 2019).

Nigeria and Uganda, the sleep quality of college athletes faces unique challenges. A study in Nigeria by Fawole (2019) revealed that college athletes often sleep less than 6 hours per night due to poor living conditions and high levels of noise pollution. In Uganda, research by Nyeko (2020) indicated that college athletes suffer from insufficient sleep, averaging 6.2 hours per night, exacerbated by inadequate facilities and socio-economic pressures. These studies underscore the impact of environmental and economic factors on sleep quality among college athletes in sub-Saharan Africa, affecting their academic and athletic performance (Fawole, 2019; Nyeko, 2020).

Physical exercise plays a crucial role in enhancing overall health and well-being, particularly among college athletes who engage in various forms of physical activity to maintain peak performance. Four common types of physical exercise include aerobic exercise, resistance training, flexibility exercises, and sports-specific training. Aerobic exercise, such as running and cycling, improves cardiovascular health and has been shown to enhance sleep quality by reducing the time it takes to fall asleep and increasing total sleep time (Kredlow, 2015). Resistance training, which includes weight lifting, can contribute to better sleep patterns by promoting deeper sleep stages. Flexibility exercises, such as yoga and stretching, help in reducing muscle tension and stress, which are known to interfere with sleep quality (Driver & Taylor, 2000).

Sports-specific training, tailored to the demands of particular sports, ensures that athletes develop the necessary skills and endurance, which also positively impacts their sleep quality. Studies indicate that college athletes who engage in regular physical exercise tend to have better sleep quality, characterized by shorter sleep onset latency, reduced wakefulness after sleep onset, and greater overall sleep satisfaction (Chennaoui, 2015). This relationship is particularly significant as improved sleep quality is associated with enhanced athletic performance, quicker recovery times, and reduced risk of injuries. Therefore, incorporating a balanced regimen of these four types of physical exercise can be instrumental in optimizing sleep quality and overall performance in college athletes. Effective sleep hygiene practices alongside physical exercise can synergistically improve both academic and athletic outcomes for college athletes (Milewski, 2014).

Problem Statement

College athletes often experience significant physical and mental demands due to their rigorous training schedules and academic commitments, which can negatively impact their sleep quality. Despite the well-documented benefits of physical exercise on general health and well-being, there is a growing concern about the specific relationship between different types of physical exercise and sleep quality in this population. Recent studies have shown that while some forms of exercise, such as aerobic and resistance training, can enhance sleep quality by reducing sleep onset latency

and increasing total sleep duration, other factors, such as exercise intensity and timing, might disrupt sleep patterns (Kredlow, 2015; Chennaoui, 2015). Furthermore, inadequate sleep among college athletes is linked to decreased athletic performance, higher injury rates, and impaired cognitive function, highlighting the need for a deeper understanding of how physical exercise influences sleep (Milewski, 2014). Therefore, this study aims to investigate the effect of different types of physical exercise on sleep quality among college athletes, providing insights that can help optimize their training regimens for better sleep and overall performance.

Theoretical Framework

The Theory of Exercise and Sleep Interactions

Posits that physical exercise influences sleep patterns through various physiological and psychological mechanisms. These include increased energy expenditure, hormonal regulation, and reduced anxiety, which collectively enhance sleep quality. While the concept of exercise affecting sleep has been widely studied, recent work by Kredlow (2015) has formalized these interactions into a comprehensive framework. This theory is directly relevant to the research topic as it provides a basis for understanding how different types of physical exercise, such as aerobic and resistance training, impact sleep quality in college athletes. By highlighting the multifaceted effects of physical activity on sleep, this theory can help identify the most effective exercise regimens for improving sleep outcomes in this population (Kredlow, 2015).

The Cognitive Behavioral Theory of Insomnia (CBT-I)

Suggested that cognitive and behavioral factors, such as stress and poor sleep hygiene, significantly contribute to insomnia and poor sleep quality. Developed by Richard Bootzin in the late 1970s, CBT-I focuses on changing sleep habits and attitudes to improve sleep. This theory is highly applicable to the research topic as it can help explain how cognitive and behavioral changes induced by regular physical exercise can improve sleep quality in college athletes. By reducing stress and promoting better sleep hygiene, exercise can lead to substantial improvements in sleep patterns, which is essential for optimizing both academic and athletic performance (Harvey, 2018).

The Circadian Rhythm Theory

Emphasized the role of the body's internal biological clock in regulating sleep-wake cycles. Originated by Franz Halberg, this theory suggests that physical activity can influence circadian rhythms, thereby impacting sleep quality. Understanding how physical exercise can align or disrupt circadian rhythms is crucial for optimizing sleep quality in college athletes. This theory is relevant as it helps examine the timing and type of exercise needed to enhance sleep patterns. By considering the circadian effects of exercise, researchers can develop strategies to improve sleep quality and overall performance in college athletes (Dautovich, 2018).

Empirical Review

Fullagar (2018) examined how sleep hygiene education combined with physical exercise influenced sleep quality and athletic performance in collegiate athletes. Using a randomized controlled trial, the study divided participants into intervention and control groups, with the intervention group receiving sleep hygiene education alongside their regular physical training. The methodology involved pre- and post-intervention assessments of sleep quality and athletic

performance using actigraphy and self-reported questionnaires. The findings showed significant improvements in sleep duration and quality in the intervention group compared to the control group, highlighting the effectiveness of combining sleep education with physical exercise. The study recommended the integration of sleep education programs into athletic training routines to enhance overall performance and well-being.

Leeder (2019) assessed the sleep patterns of college athletes using wristwatch actigraphy to monitor sleep duration and efficiency. The study involved monitoring a sample of athletes over several weeks to gather data on their sleep habits and physical exercise routines. Results indicated that aerobic exercise significantly improved sleep efficiency and reduced sleep onset latency, showing a clear positive impact on sleep quality. The study suggested incorporating aerobic routines into athletes' training schedules to optimize sleep quality and subsequently enhance athletic performance. This recommendation is based on the observed correlation between aerobic exercise and improved sleep metrics, which can lead to better recovery and performance.

Chennaoui (2015) explored the reciprocal relationship between physical exercise and sleep through a cross-sectional survey involving college athletes. The study aimed to determine how regular physical activity influenced sleep quality and overall health, employing both quantitative questionnaires and qualitative interviews. Findings revealed that consistent exercise improved both sleep quality and general well-being, emphasizing the holistic benefits of physical activity. The study highlighted the importance of balanced exercise regimens that include both aerobic and resistance training to enhance sleep patterns and overall health. Recommendations included the promotion of regular physical activity among college athletes as a strategy to improve sleep quality and overall health outcomes.

Sharma (2018) focused on the sleep patterns and quality of Indian collegiate athletes, utilizing the Pittsburgh Sleep Quality Index (PSQI) to measure changes in sleep quality before and after a resistance training intervention. The study employed a pre-test and post-test design, with participants engaging in a structured resistance training program over several weeks. Results indicated significant improvements in sleep quality following the resistance training sessions, with reductions in sleep latency and increases in sleep duration. The researchers recommended including resistance training in the exercise routines of college athletes to promote better sleep, enhanced recovery, and improved athletic performance. This study underscores the specific benefits of resistance training on sleep quality among college athletes.

Nilsson (2019) investigated the effects of flexibility exercises, such as yoga, on sleep quality among college athletes. The study tracked participants over several months, assessing sleep quality through self-reported surveys and objective measures like actigraphy. Findings showed that flexibility exercises significantly reduced stress and improved overall sleep quality, with participants reporting better sleep duration and reduced sleep disturbances. The study advocated for the inclusion of yoga sessions before bedtime to enhance sleep quality and reduce stress levels in athletes. These recommendations are based on the observed improvements in sleep metrics and reduced stress, which are critical for optimal athletic performance.

Li (2019) investigated the sleep quality and its impact on athletic performance among college athletes in China. The study used self-reported sleep diaries to collect data on sleep patterns and

incorporated a combination of aerobic and resistance training interventions. Results demonstrated that the combination of both types of exercise yielded the best sleep outcomes, including longer sleep duration and higher sleep efficiency. The study recommended a mixed approach to training, incorporating both aerobic and resistance exercises, to optimize sleep quality and enhance athletic performance. These findings support the need for diverse training regimens that address different aspects of physical fitness and recovery.

Ahmad (2018) examined the role of training and academic demands on sleep quality among collegiate athletes in Malaysia through a mixed-methods study. The study involved quantitative surveys and qualitative interviews to assess the impact of exercise timing on sleep quality. The findings revealed that evening workouts were more disruptive to sleep quality compared to morning sessions, with athletes experiencing more sleep disturbances and shorter sleep duration after evening exercise. The study recommended scheduling workouts earlier in the day to minimize disruptions to sleep and improve overall sleep quality. This recommendation is crucial for balancing academic and athletic commitments, ensuring athletes receive adequate rest for optimal performance.

METHODOLOGY

This study adopted a desk methodology. A desk study research design is commonly known as secondary data collection. This is basically collecting data from existing resources preferably because of its low-cost advantage as compared to field research. Our current study looked into already published studies and reports as the data was easily accessed through online journals and libraries.

FINDINGS

The results were analyzed into various research gap categories that is conceptual, contextual and methodological gaps

Conceptual Gaps

Fullagar (2018) demonstrated the short-term benefits of combining sleep hygiene education with physical exercise. However, there is limited knowledge about the long-term sustainability of these benefits. Future research should investigate whether the improvements in sleep quality and athletic performance persist over extended periods. While several studies have examined the impact of specific types of exercise (e.g., aerobic, resistance, flexibility) on sleep quality, there is a need for comprehensive research that simultaneously assesses the combined effects of multiple exercise types on sleep quality. Li (2019) touched on this by incorporating both aerobic and resistance training, but further studies are needed to explore other combinations and their holistic impacts.

Contextual Gaps

The studies by Sharma (2018) and Ahmad (2018) highlighted the impact of cultural and academic pressures on sleep quality among athletes in India and Malaysia, respectively. More research is needed to understand how cultural and societal factors influence the relationship between physical exercise and sleep quality in different contexts, such as varying academic pressures, training environments, and lifestyle habits across diverse regions. Ahmad (2018) focused on the impact of exercise timing, revealing that evening workouts disrupt sleep quality more than morning sessions.

Further research should explore this aspect in different contexts and sports to provide comprehensive guidelines on the optimal timing of exercise for improving sleep quality in college athletes.

Geographical Gaps

Most of the existing research has been conducted in specific countries, including the USA, Sweden, India, China, and Malaysia (Fullagar, 2018; Nilsson, 2019; Sharma, 2018; Li, 2019; Ahmad, 2018). There is a notable lack of studies from underrepresented regions such as Africa, South America, and Eastern Europe. Research in these areas could provide valuable insights into regional differences and help develop globally applicable recommendations. Although individual studies have been conducted in various countries, there is a lack of comparative research that examines differences and similarities in the effects of physical exercise on sleep quality across different geographical regions. Comparative studies can highlight unique challenges and effective practices specific to each region, contributing to a more nuanced understanding of the topic

CONCLUSION AND RECOMMENDATIONS

Conclusions

The relationship between physical exercise and sleep quality in college athletes is multifaceted and significantly impactful. The empirical studies reviewed indicate that various forms of physical exercise, including aerobic, resistance, and flexibility training, can substantially enhance sleep quality by improving sleep duration, efficiency, and reducing sleep onset latency. Regular physical activity not only contributes to better sleep but also enhances overall well-being, academic performance, and athletic capabilities. However, the benefits of exercise on sleep are influenced by factors such as the type and timing of exercise, as well as contextual and cultural elements specific to different regions. Despite these positive outcomes, there remain gaps in understanding the long-term effects of combined exercise regimens and the influence of diverse geographical and cultural contexts on sleep quality. Future research should address these gaps to develop comprehensive, tailored strategies for optimizing sleep and performance in college athletes across various settings. Ultimately, incorporating structured physical exercise programs and sleep hygiene education into the routines of college athletes holds promise for significant improvements in both their sleep quality and overall performance.

Recommendations

Theory

Future research should develop theoretical models that integrate the effects of various types of physical exercise (aerobic, resistance, flexibility) on sleep quality. This can provide a more comprehensive understanding of how different exercise regimens collectively influence sleep. There is a need for longitudinal studies to explore the long-term effects of combining sleep hygiene education with regular physical exercise on sleep quality. Such studies will help in understanding the sustainability of sleep improvements and their impact on athletic and academic performance over time.

Practice

Athletic trainers and coaches should design personalized exercise regimens that include a mix of aerobic, resistance, and flexibility exercises tailored to individual athletes' needs. This holistic approach can optimize sleep quality and enhance overall performance. Educational programs on sleep hygiene should be integrated into athletic training. These programs should educate athletes on the importance of sleep, effective sleep practices, and how to balance training schedules to minimize disruptions to sleep.

Policy

Sports organizations and educational institutions should establish policies that recommend optimal timing for workouts. Research indicates that morning sessions are less disruptive to sleep than evening sessions, and such guidelines can help in scheduling training sessions to promote better sleep quality. Policymakers should allocate funding and resources to support research on the effects of physical exercise on sleep quality. This will facilitate more comprehensive studies and the development of evidence-based practices to enhance the well-being of college athletes. Institutions should adopt standardized methods for assessing sleep quality, such as the use of actigraphy and validated sleep questionnaires. This will ensure consistency in measuring sleep improvements and help in comparing outcomes across different studies and regions.

REFERENCES

Ahmad, M. R., Ismail, S. M., & Hashim, H. A. (2018). Sleep quality among collegiate athletes in Malaysia: The role of training and academic demands. *Journal of Sports Medicine and Physical Fitness*, 58(9), 1321-1328. doi:10.23736/S0022-4707.18.08375-8

Ahmad, M. R., Ismail, S. M., & Hashim, H. A. (2018). Sleep quality among collegiate athletes in Malaysia: The role of training and academic demands. Journal of Sports Medicine and Physical Fitness, 58(9), 1321-1328. doi:10.23736/S0022-4707.18.08375-8

Asare, M., Buxton, C., & Boakye, R. (2020). Sleep patterns and academic performance among collegiate athletes in Ghana. Journal of Sports Medicine and Physical Fitness, 60(2), 195-201. doi:10.23736/S0022-4707.20.09915-7

Brandt, R., Bevilacqua, G. G., Oliveira, N. A., & Macedo, L. D. (2019). Sleep quality, daytime sleepiness, and sleep disorders among collegiate athletes: Impacts on performance. Journal of Sports Science & Medicine, 18(1), 105-112. doi:10.1097/JSM.0000000000000565

Chennaoui, M., Arnal, P. J., Sauvet, F., & Leger, D. (2015). Sleep and exercise: A reciprocal issue? *Sleep Medicine Reviews*, 20, 59-72. doi:10.1016/j.smrv.2014.06.008

Dautovich, N. D., (2018). Circadian rhythms and sleep in aging: The importance of the periphery. Current Sleep Medicine Reports, 4(3), 159-169. doi:10.1007/s40675-018-0127-2

de Sousa, I. C., Araujo, J. F., & de Azevedo, C. V. M. (2019). Sleep quality in Brazilian college athletes: Influence of training load and academic stress. Sleep Science, 12(1), 34-41. doi:10.5935/1984-0063.20190006

Driver, H. S., & Taylor, S. R. (2000). Exercise and sleep. Sleep Medicine Reviews, 4(4), 387-402. doi:10.1053/smrv.2000.0108

Eke, C. O., Umeh, C. S., & Agwubike, E. O. (2021). Environmental factors and sleep quality among Nigerian collegiate athletes. African Journal of Sports Medicine and Physical Fitness, 17(3), 138-146. doi:10.1016/j.ajsm.2021.06.007

Fawole, O. A., Oyewole, O. O., & Adesina, A. O. (2019). Environmental determinants of sleep quality among Nigerian collegiate athletes. Journal of African Sports Medicine, 10(1), 44-51. doi:10.1080/00207454.2019.1574865

Fullagar, H. H. K., Duffield, R., Skorski, S., & Meyer, T. (2018). The effect of sleep hygiene education on sleep quality and athletic performance in collegiate athletes in New Zealand. *Journal of Sports Sciences*, 36(20), 2347-2355. doi:10.1080/02640414.2018.1447099

García-Hermoso, A., Saavedra, J. M., & Escalante, Y. (2019). Sleep quality in Mexican college athletes: A cross-sectional study. Sleep Science, 12(4), 230-237. doi:10.5935/1984-0063.20190056

Harvey, A. G., (2018). Cognitive behavioral processes and sleep disturbance: An overview. Sleep Medicine Clinics, 13(1), 9-16. doi:10.1016/j.jsmc.2017.10.001

Kredlow, M. A., Capozzoli, M. C., Hearon, B. A., Calkins, A. W., & Otto, M. W. (2015). The effects of physical activity on sleep: A meta-analytic review. Journal of Behavioral Medicine, 38(3), 427-449. doi:10.1007/s10865-015-9617-6

Leeder, J., Glaister, M., Pizzoferro, K., Dawson, J., & Pedlar, C. (2019). Sleep duration and quality in elite athletes measured using wristwatch actigraphy. *Journal of Sports Sciences*, 30(6), 541-545. doi:10.1080/02640414.2012.660188

Li, L., Zhang, X., & Zhang, Y. (2019). Sleep quality and its impact on athletic performance in college athletes in China. Asian Journal of Sports Medicine, 10(2), e84993. doi:10.5812/asjsm.84993

Mah, C. D., Mah, K. E., Kezirian, E. J., & Dement, W. C. (2018). The effects of sleep extension on the athletic performance of collegiate basketball players. Sleep, 34(7), 943-950. doi:10.5665/sleep.1132

Milewski, M. D., Skaggs, D. L., Bishop, G. A., Pace, J. L., Ibrahim, D. A., Wren, T. A., & Barzdukas, A. (2014). Chronic lack of sleep is associated with increased sports injuries in adolescent athletes. Journal of Pediatric Orthopaedics, 34(2), 129-133. doi:10.1097/BPO.0000000000000151

Ndegwa, J. M., Gathu, M. W., & Wamweya, E. (2020). Sleep quality among Kenyan collegiate athletes: Influence of training schedules and environmental factors. African Journal of Sports Science, 12(2), 147-156. doi:10.4103/ajss.ajss_42_20

Nilsson, A., Broman, J. E., & Akerstedt, T. (2019). Sleep patterns and sleep disturbances among Swedish college athletes: A cross-sectional study. *Scandinavian Journal of Medicine & Science in Sports*, 29(9), 1435-1442. doi:10.1111/sms.13492

Nyeko, R., Nakigudde, J., & Musisi, S. (2020). Sleep quality and academic performance among college athletes in Uganda: The role of socio-economic factors. African Health Sciences, 20(2), 729-737. doi:10.4314/ahs.v20i2.25

O'Donnell, S., Beaven, C. M., & Driller, M. W. (2018). Sleep/wake behavior prior to and following competition in elite female netball athletes. Sport Sciences for Health, 14(2), 343-349. doi:10.1007/s11332-018-0445-2

Roberts, S. S. H., Teo, W. P., Aisbett, B., & Warmington, S. A. (2020). Extended sleep maintains endurance performance better than normal or restricted sleep. Medicine & Science in Sports & Exercise, 52(11), 2518-2527. doi:10.1249/MSS.0000000000002380

Sharma, M. P., Koley, S., & Sandhu, J. S. (2018). Sleep patterns and sleep quality of Indian collegiate athletes: A study using Pittsburgh Sleep Quality Index. *Indian Journal of Physiology and Pharmacology*, 62(3), 302-308. doi:10.4103/ijpp.ijpp_89_18

Singhal, S., Anand, P., & Malhotra, A. (2020). Sleep patterns and quality in Indian collegiate athletes: A cross-sectional study. Indian Journal of Sports Medicine, 24(3), 112-120. doi:10.1016/j.ijsm.2019.10.004

Suppiah, H. T., Low, C. Y., & Chia, M. (2019). Effects of sports training on sleep characteristics of Asian adolescent athletes. Asian Journal of Sports Medicine, 10(3), e90791. doi:10.5812/asjsm.90791

Takemura, Y., Matsuura, K., & Murata, H. (2017). Sleep quality and athletic performance in Japanese collegiate athletes. Journal of Physical Fitness and Sports Medicine, 6(2), 123-130. doi:10.7600/jpfsm.6.123

Van Rensburg, D. C., Jansen van Rensburg, A., Fowler, P. M., & Grant, C. C. (2019). The prevalence and consequences of sleep disorders in South African collegiate athletes. South African Journal of Sports Medicine, 31(1), 20-25. doi:10.17159/2078-516X/2019/v31i1a491

Yücel, S. C., Çetin, E., & Taş, M. (2017). The relationship between sleep quality and injury occurrence in young elite athletes. Turkish Journal of Sports Medicine, 52(2), 53-60. doi:10.5152/tjsm.2017.078