

RELATIONSHIP BETWEEN SLEEP QUALITY AND PHYSICAL FITNESS AMONG MEDICAL STUDENTS OF THE 2024 COHORT**Desak Agung Diah Pramesti Dewi¹, Susy Purnawati,² Indira Vidiari Juhanna,³ Nila Wahyuni,⁴**
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ABSTRACT

Sleep quality is a vital indicator for maintaining physical health. Physical fitness is known to play a role in maintaining the body's physiological functions. This study aimed to determine the relationship between physical fitness and sleep quality among medical students of the Faculty of Medicine, Udayana University, class of 2024. This research employed an analytical observational design with a cross-sectional approach. The subjects were n=80 active students from the Undergraduate Medical Study Program, FK UNUD, class of 2024, selected using a simple random sampling technique. Physical fitness data were measured using the bleep test, while sleep quality data were collected through the PSQI questionnaire. Data were analyzed using descriptive analysis and the Chi-Square test to determine the relationship between variables. Based on the crosstabulation results, the majority of respondents with poor sleep quality exhibited low physical fitness, whereas good sleep quality was more frequently associated with moderate to high physical fitness. The Chi-square test showed a significant relationship between sleep quality and physical fitness ($p < 0.001$). Further analysis yielded a PR value of 0.30 with a 95% CI: 0.15–0.63, which confirmed that good sleep quality was associated with higher levels of physical fitness. There was a significant relationship between physical fitness and sleep quality among medical students. Students with better physical fitness tended to have more optimal sleep quality. These results indicate the importance of regular physical activity as a supporting factor in maintaining sleep quality and the physiological well-being of medical students.

Keywords: Physical fitness, sleep quality, medical students, physical activity, PSQI.**INTRODUCTION**

Sleep quality is a vital indicator for maintaining physical and mental health. Among medical students, sleep quality is frequently compromised due to high academic burdens, stress, and a tendency toward sedentary behavior. Chronic sleep disturbances can lead to decreased concentration, impaired physiological functions, and a decline in both academic productivity and overall quality of life.

Various studies have shown that the prevalence of poor sleep quality among students, particularly medical students, is relatively high. Factors such as long study durations, academic pressure, and an inactive lifestyle contribute to these sleep disturbances. This situation makes sleep quality a relevant health issue that warrants serious attention within the medical student population¹.

Physical fitness is the body's ability to perform daily activities effectively without experiencing excessive fatigue

while maintaining energy reserves. Sufficient physical activity is known to play a role in enhancing physical fitness and assisting the body's physiological regulation, including the nervous and hormonal systems involved in the sleep process. Individuals with good physical fitness tend to have more regular sleep patterns and more optimal sleep quality².

Although numerous studies have reported a relationship between physical fitness and sleep quality, the results remain varied and inconsistent, especially among medical students in Indonesia. Therefore, research concerning the relationship between physical fitness and sleep quality among students of the Faculty of Medicine, Udayana University, class of 2024, is essential to provide a clearer empirical overview. This study aimed to determine the relationship between physical fitness and sleep quality among medical students of the Faculty of Medicine, Udayana University, class of 2024.

LITERATURE REVIEW

Sleep

Epidemiological Data on Sleep Quality

Poor sleep quality was a global health issue with a high prevalence, particularly among young adults. Epidemiological studies showed that approximately one-third of the adult population did not meet the recommended sleep duration. Among students, especially medical students, the prevalence of sleep disturbances was reported to be higher than in the general population, which was associated with academic burden, stress, and lifestyle changes. In Indonesia, the majority of students were reported to have poor sleep quality, making this condition a health issue that warranted special attention³.

Definition of Sleep and Sleep Quality

Sleep is a physiological state characterized by a reversible decrease in consciousness and plays a vital role in the recovery of physical and mental functions. Sleep quality is not only determined by sleep duration but also encompasses subjective aspects such as sleep onset latency, sleep continuity, and the level of alertness after waking. Good sleep quality is characterized by short sleep latency, high sleep efficiency, minimal sleep disturbances, and a duration appropriate for age requirements⁴.

Physiology of Sleep

The sleep process is an active mechanism involving complex interactions between the central nervous system and the autonomic nervous system. Sleep regulation is influenced by the activity of brain structures such as the raphe nuclei, hypothalamus, and the reticular system. Neurotransmitters and hormones, such as serotonin and melatonin, play crucial roles in initiating and maintaining sleep. Furthermore, sleep is regulated by two primary mechanisms: sleep homeostasis and circadian rhythms, which work synergistically to regulate the sleep-wake cycle^{4,5}.

Stages of Sleep

Sleep consists of two main phases: Non-Rapid Eye Movement (NREM) and Rapid Eye Movement (REM). The NREM phase is divided into several stages characterized by decreased physiological activity and increased body recovery processes. REM sleep is marked by increased brain activity, intense dreaming, and plays an essential role in memory consolidation and emotional regulation. NREM and REM cycles occur repeatedly throughout the night and contribute to overall sleep quality^{3,5}.

Sleep Requirements

Sleep requirements vary based on age and individual conditions. For young adults, the recommended sleep duration is approximately 7–9 hours per night. Chronic sleep deprivation could lead to impaired cognitive function, decreased physical fitness, and an increased risk of health disorders. Therefore, fulfilling adequate sleep needs is a vital aspect of maintaining individual health and performance³.

Factors Affecting Sleep Quality

Sleep quality is influenced by various internal and external factors. Internal factors include health status, stress, nutritional status, body mass index, hormonal factors, and genetics. External factors include the sleep environment, physical activity, and the consumption of certain medications. Physical activity and physical fitness are modifiable factors that play a significant role in improving sleep quality when performed regularly and at an appropriate intensity⁴.

Measurement of Sleep Quality

Sleep quality can be measured subjectively using standardized questionnaires, one of which is the Pittsburgh Sleep Quality Index (PSQI). This instrument assessed sleep quality over the past month through several components, such as sleep duration, sleep latency, sleep disturbances, and daytime dysfunction. The PSQI global score was used to classify sleep quality as good or poor, making this instrument widely used in clinical and epidemiological research⁶.

Physical Fitness

Definition of Physical Fitness

Physical fitness is defined as the body's ability to perform daily activities effectively without experiencing excessive fatigue while maintaining energy reserves. Physical fitness reflects the optimal condition of the cardiovascular, respiratory, and musculoskeletal systems, enabling individuals to carry out physical and mental activities productively^{1,7}.

Components of Physical Fitness

Physical fitness consists of several primary health-related components, including cardiorespiratory endurance, muscular strength, flexibility, body composition, and maximal oxygen capacity (VO₂ max). These components interact and determine the body's ability to sustain physical activity over a certain period. VO₂ max is frequently used as the primary indicator of cardiorespiratory fitness⁸.

Benefits of Physical Fitness

Good physical fitness provides various benefits, including enhancing the immune system, reducing the risk of chronic diseases, improving mental health, and increasing concentration and productivity. For students, physical fitness plays a role in supporting academic performance and the ability to adapt to high academic demands⁹.

Measurement of Physical Fitness

Physical fitness can be measured through various cardiorespiratory tests, one of which is the bleep test. The bleep test was used to estimate VO₂ max capacity and assess cardiovascular endurance. This test was practical, easy to implement, and widely used in physical fitness research among young populations^(7,10).

The Relationship Between Sleep Quality and Physical Fitness

Sleep quality and physical fitness have a reciprocal relationship. Physical activity that improves physical fitness could

enhance the regulation of hormones and the nervous system involved in the sleep process, thereby improving sleep quality. Conversely, poor sleep quality could decrease physical fitness due to impaired bodily recovery and increased fatigue. Numerous studies showed a significant relationship between physical fitness and sleep quality, although some research findings still indicated varied results⁸.

MATERIALS AND METHODS

This study was an analytical observational research employing a cross-sectional design. The research subjects were active students from the Undergraduate Medical Study Program, Faculty of Medicine, Udayana University, class of 2024.

There are 80 respondents were selected using a simple random sampling technique in accordance with the established inclusion and exclusion criteria. Sleep quality was measured using the Pittsburgh Sleep Quality Index (PSQI) questionnaire, while physical fitness was assessed using the bleep test to measure cardio-respiratory endurance capacity.

Data were analyzed descriptively and bivariate. The Chi-square test was utilized to evaluate the relationship between physical fitness and sleep quality, with a statistical significance level set at $p < 0.05$.

RESULT

Research Result

This study was conducted between September and October 2025, involving students from the Faculty of Medicine, Udayana University, class of 2025, as respondents. The research was carried out after obtaining an ethical clearance certificate from Udayana University. A total of 82 respondents initially met the established inclusion and exclusion criteria. However, out of these 82 respondents, 2 were dropped out because they did not complete the questionnaire and were unwilling to perform the bleep test. Consequently, the final data processed consisted of 80 respondents.

Respondent Characteristics

Table 1 presents the distribution of respondents based on gender, age, and nutritional status as indicated by the Body Mass Index (BMI).

Table 1 Responden Characteristics

Variable	Category	n	%
Gender	Male	38	47,5
	Female	42	52,5
Ages	Young Adult	80	100
BMI	Underweight	9	11,3
	Normal	55	68,8
	Overweight	8	10
	Obese	8	10

This study involved a total of 80 respondents. The characteristics were described based on gender, age, and nutritional status (Body Mass Index/BMI). In general, the respondents were predominantly female, totaling 42 individuals (52.5%), while male respondents numbered 38 individuals (47.5%).

Regarding the age distribution, the majority of respondents were concentrated in the 19-year-old group, reaching a significant total of 62 individuals (77.5%).

The proportions of other age groups were as follows: 20 years old (10 individuals or 12.5%), 18 years old (7 individuals or 8.8%), and 21 years old, which represented the smallest group with only 1 individual (1.3%).

Based on the nutritional status measured by BMI, most respondents were in the normal category, totaling 55 individuals (68.8%). Respondents in the underweight category numbered 9 individuals (11.3%), while the overweight and obese categories had equal proportions, with 8 individuals (10.0%) each. had equal proportions, with 8 individuals (10.0%) each.

Distribution of Sleep Quality and Physical Fitness

The following table presents the distribution of the respondents' sleep quality and physical fitness.

Table 2 Distribution of Sleep Quality and Physical Fitness

Variable	n	%
Sleep Quality		
Good Quality (≤ 5)	40	50
Bad Quality (> 5)	40	50
Physical Fitness		
Low (5 – 6)	41	51,2
Moderate (7 – 9)	30	37,5
High (≥ 10)	9	11,3

Based on the measurement of sleep quality using the Pittsburgh Sleep Quality Index (PSQI), it was found that out of the 80 respondents, the proportion between good and poor sleep quality was equally distributed. Respondents with good sleep quality (score ≤ 5) totaled 40 individuals (50%), while respondents with poor sleep quality (score > 5) also totaled 40 individuals (50%).

Based on the physical fitness measurements using the Bleep Test, it was observed that out of the total 80 respondents, the majority fell into the low physical fitness

category, totaling 41 individuals (51.2%). A total of 30 respondents (37.5%) were in the moderate physical fitness category, while only 9 respondents (11.3%) were classified in the high physical fitness category.

The Relationship Between Physical Fitness and Sleep Quality

Based on the analysis of the relationship between physical fitness and sleep quality among the respondents, the following results were obtained.

Table 3 Results of the Analysis on the Relationship Between Physical Fitness and Sleep Quality Among Students of the Faculty of Medicine, Udayana University, Class of 2024

		Physical Fitness							
		Low	Moderate	High	Total	p-value	PR	CI 95%	
		n	n	n	n			Lower	Upper
Sleep Quality	Bad	%	%	%	%	< 0.001	0,304	0,15	0,63
		33	7	0	40				
		82,5%	17,5%	0,0%	100%				
	Good	8	23	9	40				
		20,0%	57,5%	22,5%	100%				
Total	n	41	23	9	80				
		51,2%	57,5%	11,3%	100%				

Bivariate analysis was performed on 80 respondents to examine the relationship between sleep quality and physical fitness. The distribution results showed a contrasting pattern between the two sleep quality groups.

In the group with poor sleep quality (n = 40), the majority of respondents, specifically 33 individuals (82.5%), had low physical fitness. The remaining 7 individuals (17.5%) were in the moderate physical fitness category, and no respondents (0%) were found with high physical fitness.

In contrast, in the group with good sleep quality (n = 40), the largest proportion of respondents (23 individuals or 57.5%) was in the moderate physical fitness category. Furthermore, 9 individuals (22.5%) were classified as

having high physical fitness, while only 8 individuals (20.0%) were classified with low physical fitness.

The results of the statistical test using the Chi-square test indicated that there was a significant relationship between sleep quality and physical fitness, with a value of $p < 0.001$, meaning the relationship was statistically significant ($p < 0.05$). This finding indicates that respondents with good sleep quality tended to have higher levels of physical fitness compared to respondents with poor sleep quality, with a Prevalence Ratio (PR) of 0.30 and a 95% Confidence Interval (95% CI) between 0.15 and 0.63.

DISCUSSION

This study demonstrated a significant relationship between sleep quality and physical fitness among medical students of Udayana University, class of 2024, with a Chi-Square test result of $p=0.001$ ($p<0.05$). Students with poor sleep quality showed a lower prevalence of moderate physical fitness compared to those with good sleep quality (PR = 0.30; 95% CI: 0.15–0.63), indicating that poor sleep quality was associated with a decrease in physical fitness levels(11).

Physiologically, good physical fitness reflects the efficiency of the cardiovascular and respiratory systems, which supports the regulation of sleep hormones, enhancement of parasympathetic activity, and the prolongation of Non-Rapid Eye Movement (NREM) sleep phases, particularly slow-wave sleep(12).

This mechanism plays a vital role in tissue recovery and energy balance during sleep. Conversely, low physical fitness is associated with increased stress hormones and circadian rhythm disturbances, which can diminish sleep quality(12,13).

These findings were consistent with various previous studies reporting a positive relationship between physical fitness and sleep quality among student populations. For medical students, who face a high risk of sleep disturbances due to academic stress, these results confirmed that physical fitness serves as an important protective factor. Consequently, regular physical activity with balanced intensity can serve as an effective non-pharmacological preventive strategy to enhance sleep quality and support students' health and academic performance(14,15).

CONCLUSION AND SUGGESTION

This study demonstrated a significant relationship between sleep quality and physical fitness among students of the Faculty of Medicine, Udayana University, class of 2024, where students with better sleep quality tended to have more optimal physical fitness levels. These findings underscored the importance of sleep quality as an indicator of physiological well-being among medical students. Therefore, the implementation of regular, balanced-intensity physical activity and effective stress management is recommended as a preventive effort to enhance both sleep quality and physical fitness. Future research is expected to utilize longitudinal or interventional designs and consider other factors potentially influencing sleep quality to strengthen the evidence of a causal relationship.

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