

The Relationship Between Sleep Quality and Fatigue Levels in Technical Training of Pencak Silat Athletes in the Move Category in the Greater Malang Region

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ABSTRACT

Background: This study was conducted to find out the importance of maintaining sleep quality in supporting the recovery and performance of pencak silat athletes in the movement category.

Methods: This study was conducted with a correlational approach with purposive sampling techniques on 30 pencak silat athletes. The instruments used were the *Pittsburgh Sleep Quality Index* (PSQI), *Fatigue Assessment Scale* (FAS), *Rating of Perceived Exertion* (RPE). The data analysis technique used in this study was the Spearman Rho correlation test.

Results: The results showed a significant relationship between sleep quality and post-exercise fatigue levels ($0.022 < 0.05$), with a correlation value of 0.415, indicating a moderate relationship between the two variables. Further analysis revealed no significant relationship between sleep quality and post-exercise fatigue levels ($0.703 > 0.05$), with a correlation value of -0.073, indicating a negative relationship, meaning an inverse relationship (the better the sleep quality, the lower the fatigue level, and vice versa).

Conclusions: The post-exercise correlation ($r=0.415$) indicated a moderate relationship between the two variables, between adequate rest and athlete fatigue control during exercise. The results of this study demonstrate that the proposed hypothesis is accepted, and it can be concluded that there is a significant relationship between sleep quality and fatigue levels in the technical training of pencak silat athletes in the Greater Malang area.

Keywords: sleep quality; fatigue; pencak silat athletes in the form of moves

1. Background

Pencak Silat is a sport under the auspices of the Indonesian Pencak Silat Association (IPSI), divided into two categories: sparring and jurus. In the competition category athletes are grouped based on body weight in each class, while jurus categories include: singles, doubles, teams, and creative solo (Zalsabilla & Wijaya, 2024). According to the IPSI Pencak Silat competition regulations (2024), jurus categories are performed within three minutes with a time limit of approximately five seconds. Athletes who perform jurus exceeding the tolerance limit will be subject to sanctions according to applicable regulations. These requirements require athletes to possess strong technical skills, high concentration, stable motor performance, and the ability to precisely control their movements during their performance. In addition to physical and technical aspects, athletes in the jurus category are also required to possess optimal mental readiness to maintain focus both during training and during competition.

An athlete's readiness to perform at their best is influenced not only by technical ability and physical condition, but also by fatigue levels, sleep quality, and recovery processes. Good sleep quality plays a crucial role in supporting an athlete's physiological, cognitive, and psychological functions, while poor sleep quality can increase fatigue and decrease athletic performance (Gwyther et al., 2022). Furthermore optimal recovery is

necessary to restore an athlete's physical and mental state after intensive training or competition, thereby minimizing fatigue accumulation and the risk of decreased performance (Wiewelhove et al., 2024).

Rest is a crucial part of the recovery process. Basically rest is not just a break from training, but is an important phase in restoring the body's balance so that it is ready to face the next training load. Insufficient rest can trigger increased injuries and leave athletes in a state of persistent fatigue (Saba, 2024). Fatigue during exercise can impact sleep quality and duration, as quality rest plays a role in maintaining the balance of energy expended during activity (Kriswanto et al., 2020). Rest is considered a key component in restoring an athlete's physical and psychological condition after a series of training sessions or during a competition. Research (Purnama, 2023) states that sleep patterns are a crucial component of an athlete's rest because optimal recovery requires sufficient, quality sleep. Lack of good quality sleep can slow physical and mental recovery and increase the potential risk of injury. Without adequate sleep an athlete's performance will decline drastically. Their reactions slow their focus decreases, and their emotions become unstable. Conversely quality sleep helps the body and mind fully prepare for the next training session.

Although numerous studies have examined the relationship between fatigue, sleep quality, and recovery in athletes, most research has focused on general sports or competitive athletes. Previous research has shown that good sleep quality and optimal recovery play a crucial role in maintaining physical and psychological readiness and supporting athletic performance (Doherty et al., 2021). Research specifically examining these factors in pencak silat athletes competing in the jurus category is relatively limited. This is despite the distinct characteristics of jurus competitions, which require precise movements, consistent technique, high concentration, and strict time management during performances (Salsaputri et al., 2025). Therefore there is a research gap regarding how sleep quality, fatigue levels, and recovery contribute to the performance of pencak silat athletes competing in jurus.

Based on these conditions this study is novel because it focuses on pencak silat athletes in the form of moves, examining the relationship between sleep quality, fatigue, and recovery on athlete performance. Unlike previous studies that generally examined athletes from various sports or competing categories, this study specifically analyzes the characteristics of athletes in the form of moves, which have different performance demands (Hartanto et al., 2024). Theoretically this research is expected to enrich the study of sports science, especially in the fields of sports psychology and sports physiology in pencak silat. Practically the results of this study can serve as a basis for coaches, athletes, and sports administrators in developing training programs, recovery strategies, and managing sleep quality more effectively to optimally improve the performance of pencak silat athletes in the form of moves.

2. Methods

This study employed a quantitative research design with an analytical correlational approach and a cross-sectional design. A cross-sectional design was used because data collection for all study variables was conducted at a single measurement point without any treatment or intervention on the respondents. This approach aimed to determine the relationship between sleep quality and levels of mental and physical fatigue in pencak silat athletes in the form of moves after technical training. The data analysis technique used was the Spearman Rho correlation test. The Spearman Rho test was chosen based on the characteristics of the data, which is ordinal in scale and does not require a normal distribution. The results of the analysis were used to determine the direction and strength of the relationship between the variables studied. According to (Selviana et al., 2024) a correlational study is an approach that aims to identify the relationship and strength of the relationship between variables without intervention or changes to the variables.

The data collection process was taken from the results of the questionnaire questions from the instrument, then the results of this study were calculated using statistical analysis using the SPSS 25 application. The sampling used by the researcher was purposive sampling, namely a sampling technique that was not taken randomly, but there were certain criteria that had been determined by the researcher (Nuralim et al., 2024). The inclusion criteria in this study included: 30 pencak silat athletes in the form of moves who participated in training at least 2-3 times a week and were domiciled in the Malang Region area with pre-adolescent-adult ages and were willing to be research respondents by signing an informed consent. The exclusion criteria included: athletes who were experiencing injuries so they could not participate in training normally, athletes who did not complete the questionnaire completely, and athletes who withdrew during the research process.

The study sample size was 30 pencak silat athletes in the technique category. The sample size was determined based on (Gay et al., 2012) opinion which states that correlational research requires a minimum of 30 respondents to identify relationships between variables. Furthermore (Roscoe, 1969) explained that a sample size of between 30 and 500 respondents is considered adequate for most behavioral and social research. Therefore a sample size of 30 respondents was deemed to meet the minimum requirement for correlation analysis. Respondents came from six different pencak silat training centers. Researchers visited each training center and collected data directly after the technical training sessions.

This study has received ethical approval from the Research Ethics Committee of Malang State University, under ethics letter number: No. 29.07.01/UN32.14.2.8/LT/2025. Prior to data collection all respondents were provided with an explanation of the research objectives, benefits, procedures, and their rights during the study. Respondents who agreed to participate were asked to complete an informed consent form as a form of agreement to participate in the study. The confidentiality of respondents' identities is maintained and the data obtained is only used for research purposes.

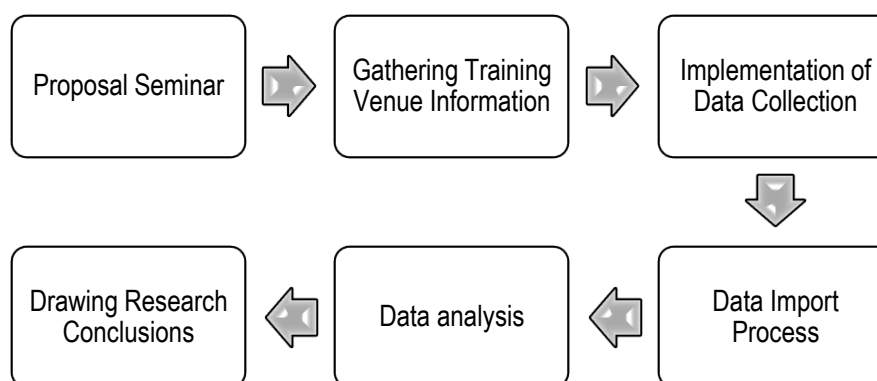


Diagram 1. Research procedure

The research instrument is the main tool in the data collection process, namely the tool used to collect and measure quantitative data related to the variables studied (Nasution, 2016). There are three instruments used, namely: 1) Pittsburgh Sleep Quality Index (PSQI): Respondents will be asked to answer questions related to information about several components as follows: a) Subjective sleep quality, b) Sleep latency (time needed to sleep), c) Sleep duration, d) Sleep efficiency (ratio between sleep time and time in bed), e) Sleep disorders, f) Use of sleeping pills, g) Daytime functional disorders (such as drowsiness or fatigue) in the study (Safaringga & Herpandika, 2018). The PSQI is an instrument developed by (Buysse et al., 1989). The instrument is available in English which was then translated into Indonesian in the study (Krisna, 2022). The PSQI instrument has been tested for validity and reliability in the study (Alim, 2015). 2) Fatigue Assessment Scale (FAS): To measure the level of athlete fatigue, researchers used the Fatigue Assessment Scale (FAS) instrument developed by (Alleva

et al., 2017). In research (Kurnia et al., 2024) showed that the FAS questionnaire consists of 10 questions that measure two main dimensions of fatigue: mental fatigue and physical fatigue. Each component in the instrument questions will be measured using a five-point Likert Scale, with a score of 1 representing "never" to a score of 5 representing "always". The FAS instrument has undergone validity and reliability tests and is declared to meet the criteria for measuring the level of fatigue in research (Rofi'i, 2022). The FAS instrument is available in English which was then translated into Indonesian in research (Febriyanti, 2025). 3) Rating of Perceived Exertion (RPE): This instrument is used to determine the scale of the athlete's level of fatigue after training. According to (Robertson, 2004), the RPE is a scale developed by (Borg, 1982) that is used as a measuring tool for individual perceptions of the intensity of physical activity in the form of a quantitative score. This scale has been shown to show a strong relationship with heart rate, maximum oxygen uptake, and lactic acid levels during physical activity (Borg, 1982). The instrument used in this study is a standard instrument that has been widely used in previous studies and has sufficient evidence of validity and reliability. Therefore, the researcher used the results of validity and reliability tests that have been reported in previous studies as the basis for using the instrument in this study.

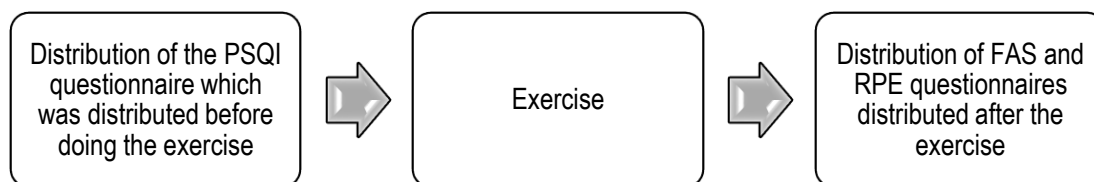


Diagram 2. Research data collection procedure

3. Results

This research was conducted in July-September involving 30 respondents, from the distribution of respondents showed that the average age of respondents was 15.7 years, with the youngest age range being 13 years and the oldest being 18 years. The average age of respondents when they first participated in training was 4.6 years with 2.0 years being the shortest training age and 13.0 years being the longest training age.

Table 1. Distribution of respondents by gender, achievement, pencak silat category, frequency of training

Variabel	n	%
Gender		
Male	9	30.0
Women	21	70.0
Performance		
National	10	33.3
Province	9	30.0
Kabupaten-kota	11	36.7
Categories of pencak silat		
Single	22	73.3
Double	5	16.7
Regu	3	10.0
Frequency of training		
2-3 times	18	60.0
3-4 times	4	13.3
4-5 times	8	26.7

The majority of respondents were female (70.0%), with the highest number of achievements at the district and city levels (36.7%), and the single category (73.3%) with the highest training frequency (60.0%). More detailed data can be found in Table 1.

Table 2. Distribution of PSQI Test Results for sleep quality

Interval	Category	Frequency (n)	Presentase (%)
<5	Good	7	23%
>5	Bad	23	77%
Quantity		30	100%

From these results, it shows that overall the sleep quality of pencak silat athletes in the form of moves in the Malang region is categorized as bad, the table refers to 30 athletes (100%) with 7 athletes (23%) having good sleep quality and 23 athletes (77%) having poor sleep quality.

Table 3. Distribution of FAS Results for Fatigue Level After Performing Technique Exercises

Interval	Category	Frequency (n)	Presentase (%)
<22	Normal	15	50%
22-34	Medium	14	47%
>34	Weight	1	3%
Quantity		30	100%

Based on these results, it shows that overall the level of fatigue experienced by athletes after undergoing technical training is classified as light, the table refers to 30 athletes (100%) with 15 athletes (50%) at a normal level of fatigue, 14 athletes (47%) at a moderate level of fatigue and 1 athlete (3%) at a severe level of fatigue.

Table 4. Distribution of RPE Results for Fatigue Level Scale After Performing Technical Training

Interval	Category	Frequency (n)	Presentase (%)
1-2	Very Light	0	0%
3-4	Lightweight	2	7%
5-6	Medium	12	40%
7-8	Height	16	53%
9	Very Heavy	0	0%
10	Maximum	0	0%
Quantity		30	100%

Based on these results, it shows that overall the level of fatigue experienced by athletes after undergoing technical training, as identified on the scale, is in the high category, this is proven by almost half or (53%) of the number of athletes.

Table 5. Analysis of Spearman's Rho Correlation of Sleep Quality to Fatigue Level and Fatigue Level Scale After Undergoing Technical Training

Correlations					
			PSQI	FAS	RPE
Spearman's rho	Quality of sleep	Correlation Coefficient	.1000	.415*	-.073
		Sig. (2-tailed)	.	.022	.703

Fatigue Level	N	30	30	30
	Correlation Coefficient	.415*	.1000	.022
	Sig. (2-tailed)	.022	.	.284
Fatigue Scale	N	30	30	30
	Correlation Coefficient	-.073	.022	.1000
	Sig. (2-tailed)	.703	.284	.
	N	30	30	30

*. Correlation is significant at the 0.05 level (2-tailed)

The results above show a significant relationship between sleep quality and fatigue levels after exercise ($0.022 < 0.05$) and a correlation value of (0.415) indicates that the closeness of the relationship between the two variables is in the moderate category. The next analysis states that there is no significant relationship between sleep quality and the scale of fatigue levels after exercise ($0.703 > 0.05$) with a correlation value of (-0.073) obtained so that it can be stated that there is a relationship with a negative sign, namely a relationship in the opposite direction (the better the quality of sleep, the tendency for fatigue levels to decrease slightly and vice versa).

4. Discussion

This study aimed to examine the relationship between sleep quality and fatigue levels in pencak silat athletes after technical training in the Greater Malang area. The results showed a significant relationship between sleep quality and fatigue levels, with a moderate correlation strength ($r = 0.415$). This finding suggests that sleep quality is related to the fatigue experienced by athletes after technical training. The poorer the sleep quality of an athlete, the higher the perceived fatigue level. These results align with research by (Gwyther et al., 2022), which states that sleep quality plays a crucial role in an athlete's physiological and psychological recovery. Quality sleep allows for tissue recovery, hormone regulation, central nervous system recovery, and energy restoration used during physical activity. Conversely poor sleep quality can lead to fatigue accumulation, decreased concentration, mood disturbances, and reduced athletic performance. Similar findings were also reported by (Doherty et al., 2021), who explained that athletes with poor sleep quality tend to experience higher levels of fatigue than those with good sleep quality. Physiologically the relationship between sleep quality and fatigue can be explained by the body's recovery processes that occur during sleep. During sleep the body experiences increased growth hormone secretion, muscle tissue repair, energy reserve replenishment, and central nervous system function recovery. If sleep duration and quality are not optimal, this recovery process is disrupted, resulting in the body not being fully recovered when the next training session resumes. This condition makes athletes more susceptible to both physical and mental fatigue during training.

Research results show a stronger correlation between mental fatigue and physical fatigue. This can be explained by the characteristics of pencak silat, which not only demands physical abilities but also requires high concentration, precise movement sequences, emotional control, focused attention, and the ability to accurately remember the sequence of moves during a performance. Poor sleep quality is known to impact cognitive function more quickly than physical ability, resulting in athletes experiencing a decline in focus, concentration, alertness, and decision-making abilities. Therefore the impact of sleep quality on mental fatigue tends to be greater than on physical fatigue in athletes in the martial arts category.

Regarding the exercise fatigue level variable measured using the Rating of Perceived Exertion (RPE), the results showed a negative correlation ($r = -0.703$). The negative correlation indicates that the better an athlete's sleep quality, the lower their perceived fatigue during exercise. Conversely poor sleep quality tends to increase

an athlete's perceived fatigue during exercise. However the significance test showed that the correlation was not statistically significant ($p > 0.05$). This condition indicates that the perception of fatigue as measured using RPE is not only influenced by sleep quality, but also by other factors such as exercise intensity, daily training load, physical fitness level, training experience, motivation, and the athlete's psychological state at the time of data collection. The insignificant correlation in the RPE variable may also be influenced by the data collection conditions, which were conducted during the post-competition phase. During this phase athletes generally undergo training programs with lower intensity than during the competition preparation phase. As a result, the perception of fatigue felt by athletes is more variable and does not fully reflect the fatigue condition due to sleep quality. These findings are supported by research (Daulah et al., 2025), which states that athlete fatigue is not solely determined by training duration but also influenced by training intensity, technique mastery, and the athlete's physical fitness level.

The novelty of this research lies in its focus, which specifically examines the relationship between sleep quality and fatigue levels in pencak silat athletes in the jurus category. To date similar research is relatively limited compared to research on competing athletes or other sports. Therefore the results of this study can provide theoretical contributions to the development of sports psychology and physiology studies, as well as practical contributions for coaches and athletes in developing training programs, recovery strategies, and sleep quality management to support the performance of pencak silat athletes in jurus category.

5. Conclusion

This study shows a significant relationship between sleep quality and fatigue levels of pencak silat athletes in the Greater Malang area after undergoing technical training. The Spearman Rho correlation test results showed a significance value of $p = 0.022$ with a correlation coefficient of $r = 0.415$, indicating a moderate relationship. These findings indicate that sleep quality plays a role in athlete fatigue, where better sleep quality tends to be associated with lower fatigue levels. Therefore sleep quality needs to be a concern in athlete training and recovery programs to help maintain physical and mental condition and support the performance of pencak silat athletes in the jurus category.

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