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The Correlation of Dietary Patterns and Sleep Duration towards The Body Fat Percentage among Pencak Silat Athletes

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ABSTRACT

This study investigates the correlation of dietary patterns, sleep duration, and body fat percentage in Pencak Silat athletes at Universitas Negeri Surabaya (UNESA). Despite an increase in athlete participation in the Pekan Olahraga Mahasiswa Nasional (POMNAS), performance outcomes have remained limited, with only bronze medals earned in recent editions. Elevated body fat percentage can impair strength, endurance, and agility – key components of athletic performance. This cross-sectional study involved 42 athletes (25 males, 17 females; aged 18–22). Dietary patterns were assessed using the Eating Behavior Patterns Questionnaire (EBPQ), sleep duration via the Sleep Timing Questionnaire (STQ), and body fat percentage was measured using Bioelectrical Impedance Analysis (BIA). Results showed a significant negative correlation of dietary patterns and both total body fat ($r = -0.429$, $p = 0.005$) and visceral fat ($r = -0.317$, $p = 0.035$), indicating that healthier dietary patterns are associated with lower fat levels. No significant correlation was found of dietary patterns and subcutaneous leg fat ($r = -0.213$, $p = 0.215$). Sleep duration showed a stronger negative correlation with total fat ($r = -0.746$, $p = 0.000$), visceral fat ($r = -0.504$, $p = 0.001$), and subcutaneous leg fat ($r = -0.572$, $p = 0.000$), emphasizing the role of adequate sleep in reducing fat accumulation. These findings highlight the importance of balanced nutrition and sufficient sleep in maintaining optimal body composition, which may enhance athletic performance in Pencak Silat.

INTRODUCTION

Pencak silat, a traditional Indonesian martial art, requires physical agility, strength, and control, and is contested in various categories, including weight-based matches (1)(2). However, recent performance trends suggest a decline in achievement among pencak silat athletes at Universitas Negeri Surabaya, with stagnant medal counts despite an increase in athlete participation in POMNAS XVI and XVII.

One of the pressing challenges in weight-based combat sports like pencak silat is the effort to maintain or reduce body weight rapidly to meet class requirements. This often leads to extreme weight-cutting methods that could affect performance. A significant contributor to this issue is body fat percentage, a crucial indicator of both fitness and nutritional status. Elevated body fat has been shown to impair endurance, power, and movement efficiency, vital aspects in combat sports(3)(4)(5). Despite its importance, limited attention has been given to the root causes of high body fat in university-level athletes.

In combat sports, maintaining optimal body composition is essential not only for performance but also for health and eligibility within weight classes. Research shows that athletes with ideal fat percentages demonstrate greater stamina and movement precision during high-intensity matches (6). Yet, studies have found that pencak silat athletes possess the highest body fat among martial arts disciplines, reaching an average of 29.7% (3), raising concerns about their training and nutritional habits.

Dietary patterns and sleep duration are two major factors influencing body fat accumulation. High-calorie diets rich in saturated fat, sugar, and processed foods contribute significantly to weight gain (7)(8). Moreover, adherence to nutritional plans can be inconsistent among student-athletes, who often make unsupervised dietary choices due to taste preferences or convenience (9). Similarly, inadequate sleep has been associated with hormonal changes that stimulate appetite, leading to increased food intake and fat storage (10)(11). This issue is prevalent, with over 60% of athletes reportedly sleeping less than 7 hours per night.

Furthermore, body fat is not a singular measurement, its components, such as total fat, visceral fat, and subcutaneous leg fat, each impact performance differently. Visceral fat, for instance, may affect metabolic function during training, while excess leg fat could hinder kicking speed and agility in

pencak silat. Therefore, understanding how lifestyle factors like diet and sleep relate to these specific fat distributions is critical. While previous studies have explored these variables separately, research on their combined effect, particularly among pencak silat athletes, is scarce. Addressing this knowledge gap can enhance athlete development programs through more targeted nutrition and recovery strategies.

Several studies have explored the influence of dietary patterns, sleep duration, and body composition on athletic performance. A study found a correlation between body composition and biomechanical performance in mixed martial arts athletes, emphasizing the importance of body composition management in optimizing performance (12).

The use of a personalized nutrition smartphone application was shown to significantly increase energy intake and reduce body fat percentage among martial arts athletes (13). Similarly, poor dietary habits in terms of quality and quantity have been significantly associated with higher body fat percentages in taekwondo athletes, potentially leading to decreased physical fitness (14).

Sleep quality has also been identified as a key factor in body composition regulation. One study found that poor sleep quality prior to competition was associated with increased fat mass and decreased muscle mass in natural bodybuilders (15). These findings are supported by other research highlighting the critical role of adequate sleep in maintaining healthy body composition among athletes (10).

Furthermore, athletes with insufficient energy and protein intake were found to have higher body fat percentages, particularly in adolescent swimmers (16). Although numerous studies have examined the effects of diet and sleep on body composition, few have specifically investigated this relationship in pencak silat athletes. Therefore, this study aims to address this research gap and contribute to improved nutritional management and athletic performance within this population.

This study aims to examine the relationship of dietary patterns, sleep duration, and body fat percentage among pencak silat athletes at Universitas Negeri Surabaya. Based on existing theories, hypotheses were developed to explore the individual associations of each factor with body fat components.

Null Hypotheses (H_0):

1. There is no significant correlation of dietary patterns and total body fat among pencak silat athletes at Universitas Negeri Surabaya.
2. There is no significant correlation of dietary patterns and visceral fat among pencak silat athletes at Universitas Negeri Surabaya.
3. There is no significant correlation of dietary patterns and subcutaneous leg fat among pencak silat athletes at Universitas Negeri Surabaya.
4. There is no significant correlation of sleep duration and total body fat among pencak silat athletes at Universitas Negeri Surabaya.
5. There is no significant correlation of sleep duration and visceral fat among pencak silat athletes at Universitas Negeri Surabaya.
6. There is no significant correlation of sleep duration and subcutaneous leg fat among pencak silat athletes at Universitas Negeri Surabaya.

Alternative Hypotheses (H_A):

1. There is a significant correlation of dietary patterns and total body fat among pencak silat athletes at Universitas Negeri Surabaya.
2. There is a significant correlation of dietary patterns and visceral fat among pencak silat athletes at Universitas Negeri Surabaya.
3. There is a significant correlation of dietary patterns and subcutaneous leg fat among pencak silat athletes at Universitas Negeri Surabaya.
4. There is a significant correlation of sleep duration and total body fat among pencak silat athletes at Universitas Negeri Surabaya.
5. There is a significant correlation of sleep duration and visceral fat among pencak silat athletes at Universitas Negeri Surabaya.

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6. There is a significant correlation of sleep duration and subcutaneous leg fat among pencak silat athletes at Universitas Negeri Surabaya.

This research applies a cross-sectional design, allowing correlational analysis between independent variables (dietary patterns and sleep duration) and dependent variables (total body fat, visceral fat, and subcutaneous leg fat). Each hypothesis will be tested separately to assess the significance of these correlation and to provide insight into how dietary and sleep behaviors influence body composition in pencak silat athletes.

RESEARCH METHOD

This study involved pencak silat athletes from Universitas Negeri Surabaya, aged between 18 and 22 years, who were registered members of the university's Pencak Silat Student Activity Unit. Inclusion criteria consisted of athletes who were actively training and willing to participate in all research procedures. Exclusion criteria included athletes who had experienced major injuries within the last month.

Participants were selected using a consecutive sampling method, in which all individuals who met the inclusion criteria and were present during data collection were included in the study. Data were collected at the Pencak Silat Laboratory of Universitas Negeri Surabaya. Each participant provided written informed consent in accordance with the applicable research ethics guidelines.

The sample size was determined using the Slovin formula, resulting in a minimum sample size of 36 participants. This number was considered sufficient to ensure adequate representation of the population and to provide statistically meaningful results.

The study utilized several measurement tools:

- Dietary patterns were assessed using the Eating Behavior Patterns Questionnaire (EBPQ). The instrument had been previously validated and demonstrated acceptable reliability with a Cronbach's Alpha of 0.832 (17).
- Sleep duration was measured using the Sleep Timing Questionnaire (STQ), with a Cronbach's Alpha of 0.83 (>0.6), indicating acceptable reliability (18).
- Body fat percentage was assessed using Bioelectrical Impedance Analysis (BIA). Specifically, the BIA method was used to measure: Total fat, Visceral fat, and Subcutaneous leg fat.

All instruments used in this study had been previously validated and demonstrated acceptable reliability

This study adopted a cross-sectional design, in which data were collected at a single point in time without any manipulation of the variables. Participants were not assigned to experimental or control groups, making the design entirely observational.

No experimental manipulations or interventions were applied in this study. Data were collected in a purely observational manner, reflecting the natural behaviors and conditions of the participants at the time of measurement.

RESULTS AND DISCUSSION

Recruitment of participants for this study took place from April 2025 to May 2025. Participants were recruited from the Gor Internasional Universitas Negeri Surabaya, specifically from the Pencak Silat Laboratory, located at Jl. Raya Kampus Unesa, Lidah Wetan, Kec. Lakarsantri, Surabaya, Jawa Timur 60213. Athletes actively training in the Pencak Silat Student Activity Unit (UKM) were the primary source of potential subjects. Follow-up was conducted after participants expressed their willingness to participate, including obtaining informed consent from each participant before they engaged in the study.

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Table 1 Correlation of Gender, Age, Dietary Patterns, Sleep Duration of Respondent

Category	n	%
Gender		
Male	25	59.5
Female	17	40.5
Age		
18-19	19	45.2
21-21	23	54.8
Dietary Patterns		
Good Diet	24	57.1
Poor Diet	18	42.9
Sleep Duration		
Insufficient	11	26.2
Adequate	31	73.8

A total of 42 athletes were recruited for this study, and no participants dropped out during the data collection phase. All participants provided complete data for the main analysis, including body measurements and questionnaire responses. Consisting of 25 male athletes (59.5%) and 17 female athletes (40.5%). Most participants were aged between 20 and 21 years (54.8%), while the remaining 45.2% were aged between 18 and 19 years. Regarding dietary patterns, 24 participants (57.1%) were categorized as having good dietary patterns, while 18 participants (42.9%) had poor dietary patterns. The majority of participants (73.8%) reported adequate sleep duration (7–8 hours per night), while 26.2% had insufficient sleep duration.

Table 2 Description of Respondent Characteristics

Category	Mean ± SD
Weight (kg)	66.5 ± 9.7
Height (cm)	66.5 ± 9.7
Total Fat (%)	19.03 ± 3.2
Visceral Fat (%)	4.7 ± 1.4
Subcutaneous Leg Fat (%)	15.4 ± 3.1

The mean body weight was 66.5 ± 9.7 kg, with a mean height of 66.5 ± 9.7 cm. The average body fat percentage was 19.03 ± 3.2%, visceral fat percentage was 4.7 ± 1.4%, and subcutaneous leg fat percentage was 15.4 ± 3.1%.

In this study, the data were analyzed using quantitative statistical methods with the aid of statistical software. Normality testing was performed first using the Shapiro-Wilk test, as the sample size was less than 50. The results of the test showed that the variables of eating patterns ($p = 0.042$), total fat ($p = 0.006$), visceral fat ($p = 0.000$), and subcutaneous leg fat ($p = 0.000$) did not follow a normal distribution ($p < 0.05$). Meanwhile, the sleep duration variable ($p = 0.171$) followed a normal distribution ($p > 0.05$). Therefore, to analyze the correlation of the independent and dependent variables, the Spearman correlation test was used, which is appropriate for non-parametric data. The correlation coefficient and significance values were used to measure the strength and direction of the correlation between the variables.

Table 3 Body Composition of Respondent

Variable	Dietary Patterns		Sleep Duration	
	r	p	r	P
Total Fat	-0.429**	0.005	-0.746**	0.000

Visceral Fat	-0.317*	0.041	-0.504**	0.001
Subcutaneous Leg Fat	-0.213	0.177	-0.572**	0.000
Subcutaneous Leg Fat	-0.213	0.177	-0.572**	0.000

The analysis showed a significant negative correlation of dietary patterns and total body fat percentage ($r = -0.429$; $p = 0.005$), as well as visceral fat percentage ($r = -0.317$; $p = 0.041$), indicating that better dietary patterns are associated with lower levels of total and visceral fat. However, the correlation of dietary patterns and subcutaneous leg fat was not statistically significant ($r = -0.213$; $p = 0.177$).
Meanwhile, sleep duration demonstrated a strong and significant negative correlation with all body fat parameters. There was a strong negative correlation of sleep duration and total fat ($r = -0.746$; $p = 0.000$), visceral fat ($r = -0.504$; $p = 0.001$), and subcutaneous leg fat ($r = -0.572$; $p = 0.000$). These findings suggest that longer sleep duration (categorized as good sleep) is associated with lower body fat percentages in the participants.

This study examines the correlation of dietary patterns, sleep duration, and body fat percentage in athletes, specifically focusing on total fat, visceral fat, and subcutaneous leg fat. The correlation of dietary patterns and total fat shows a significant negative correlation of diet and total fat, with a correlation coefficient of -0.429 ($p = 0.005$, <0.01). A healthy diet, including the consumption of protein, unsaturated fats, and micronutrients such as magnesium and zinc, is crucial for regulating energy metabolism and reducing body fat accumulation (19)(20). Additionally, a diet rich in healthy carbohydrates, fats, and B vitamins influences body composition and fat mass in athletes (21), as well as regulating insulin levels and supporting fat burning (22). These results indicate that a combination of a good diet and physical activity is essential for maintaining a healthy body fat percentage (23).
Next, the correlation of dietary patterns and visceral fat reveals a significant negative correlation of diet and visceral fat, with a correlation coefficient of $r = -0.317$ ($p = 0.041$). A healthy diet, such as consuming low glycemic index foods and high soluble fiber, can reduce visceral fat, which is linked to increased risk of chronic diseases (24). Moreover, the intake of anti-inflammatory foods like vegetables, fruits, and olive oil has been shown to effectively reduce visceral fat (25)(26). This reduction in visceral fat is crucial because visceral fat is more responsive to dietary changes compared to subcutaneous fat (27).
In contrast, the correlation of dietary patterns and subcutaneous leg fat shows a negative correlation of diet and subcutaneous leg fat (correlation coefficient $r = -0.213$), but the p-value of 0.177 indicates that this correlation is not significant. Subcutaneous fat in the lower extremities is more influenced by genetic factors and reproductive hormones such as estrogen (28). Therefore, although a healthy diet tends to reduce subcutaneous leg fat, other factors like physical activity and genetics also play an important role (29)(30).
As for the correlation of sleep duration and total fat, a strong negative correlation is observed, with a correlation coefficient of -0.746 ($p = 0.000$, <0.01). Longer sleep duration is associated with a lower body fat percentage. Adequate sleep plays a role in regulating fat metabolism hormones such as leptin and ghrelin, which influence appetite (31), as well as supporting more efficient energy utilization (32). Furthermore, optimal sleep improves muscle mass and boosts metabolism (33), which aids in the reduction of body fat (34)(35)(36).
The correlation of sleep duration and visceral fat shows a significant negative correlation with a correlation coefficient of $r = -0.504$ ($p = 0.001$). The longer the athlete's sleep duration, the lower the accumulation of visceral fat. This reduction in visceral fat is important because visceral fat is more responsive to changes in sleep patterns (37). Research supports this finding, showing that adequate sleep can enhance athletic performance by reducing visceral fat, which affects metabolism and long-term health (38).

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Lastly, the correlation of sleep duration and subcutaneous leg fat demonstrates a significant negative correlation with a correlation coefficient of r = -0.572 (p = 0.000, <0.01). The better the athlete's sleep duration, the lower the accumulation of subcutaneous leg fat. Adequate sleep supports muscle recovery and the use of subcutaneous fat as energy (39)(40). This finding is consistent with studies (41) and (42), which indicate that sufficient sleep reduces subcutaneous fat and improves body composition. Proper sleep management is essential for athletes to maintain an ideal body composition (43).

CONCLUSION

Based on the results of the study on the Correlation of Diet, Sleep Duration, and Body Fat Percentage in Silat Athletes at Universitas Negeri Surabaya, the following conclusions can be drawn:

1. The respondents in this study consisted of 42 silat athletes, with the majority being 19.5 ± 1.1 years old, indicating early adulthood. The anthropometric characteristics show variations in weight (66.5 ± 9.7 kg) and height (168.4 ± 6.5 cm), reflecting diverse physical conditions among the respondents.
2. The majority of respondents (57.1%) had a good diet, although the average diet score (101 ± 13.6) was close to the threshold of being categorized as not good. This highlights the need for greater attention to maintaining an optimal diet.
3. Most respondents (73.8%) had adequate sleep duration, with an average of 7.2 ± 0.3 hours of sleep, which meets the healthy sleep recommendations for athletes.
4. Body fat measurements showed healthy values for total fat (19.03 ± 3.2%), visceral fat (4.7 ± 1.4%), and subcutaneous leg fat (15.4 ± 3.1%). This indicates that most athletes have body fat composition that supports optimal physical performance.
5. A significant negative correlation was found between diet and total fat (-0.429) and visceral fat (-0.317). However, the correlation between diet and subcutaneous leg fat (-0.213) was not significant. These results suggest that a better diet could help reduce overall body fat, with a more pronounced effect on reducing total and visceral fat.
6. Sleep duration was significantly negatively correlated with total fat (-0.746), visceral fat (-0.504), and subcutaneous leg fat (-0.572). This indicates that adequate sleep plays a crucial role in managing body composition, especially in reducing body fat accumulation.

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