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The Relationship of Menstrual Cycle and Diet to the Perception of Taekwondo Athletes' Physical Abilities

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Abstract

This study examines how female taekwondo athletes perceive physical abilities, menstrual cycles, and diet. This study applied a quantitative method with a ceoss-sectional correlational design. A total of 36 female taekwondo athletes were recruited through total sampling techniques, divided into junior (n = 21) and senior (n = 15) groups. The instruments used included the International Physical Activity Questionnaire-Short From (IPAQ-SF) questionnaire to evaluate the perception of physical ability; Semi-Quantitative Food Frequency Questionnaire (SQ-FFQ) to measure diet; and the Menstrual Distress Questionnaire (MEDI-Q) questionnaire to assess the menstrual cycle. Data analysis was carried out using the Pearson product moment correlation test and descriptive statistics. The results of the study revealed that in the junior group, there was no significant association between diet and menstrual cycle ($r = 0.159$; $p > 0.05$), as well as between diet and views on the perception of physical ability ($r = -0.025$; $p > 0.05$). Meanwhile, in the senior group, a meaningful relationship with moderate negative strength was identified between menstrual cycle and perception of physical ability ($r = -0.516$; $p < 0.05$). In general, these findings indicate that the association between menstrual cycles and views on physical ability is situational and is more strongly seen in senior-level athletes.

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INTRODUCTION

In performance sports, athletes' performance is not only influenced by the level of physical exercise, but also by a number of variables related to body health and lifestyle habits that are all directly related to the overall condition of the athlete's body (Meignié et al., 2021). Female athletes have different bodies than male athletes due to their biological characteristics, mainly related to hormonal changes and physiological processes that often occur. As a result, female athletes' body responses to exercise and physical activity are different from those of male athletes (Dasa et al., 2021). Female athletes are more prone to fluctuations in energy levels, fatigue, and physical condition readiness due to these physiological differences. This has the potential to affect their involvement in daily physical activity routines as well as specific exercise sessions (Paludo et al., 2022). Therefore, understanding the internal aspects related to the physical condition and life habits of female athletes is essential to maintain the performance, health and sustainability of physical activity (Dos'Santos et al., 2023).

Diet is an important component in supporting athletes' physical activity, because the availability of energy and nutrients from daily consumption greatly affects the body's capacity to implement, maintain, and maximize physical activities and post-workout recovery stages (Sannan et al., 2024). Eating habits that are disproportionate or do not meet the body's needs can trigger an imbalance between energy intake and expenditure. This has the potential to reduce physical endurance, accelerate the onset of fatigue, and inhibit the body's ability to adapt to higher intensity of exercise (Mountjoy et al., 2018). Eating routines that are formed due to intense training schedules, academic responsibilities, and time constraints often worsen the condition of female athletes. This kind of diet causes the supervision of nutrient consumption to be inefficient and fosters the opportunity for energy imbalances (Syauqy et al., 2021). This condition indicates that the assessment of eating habits using standardized instruments is a crucial action to obtain a more objective view of energy consumption and nutrient consumption patterns. This also supports understanding of the relationship between the intensity of physical activity and the capacity of female athletes to maintain a sustainable performance (Saputri, 2025).

In addition to diet, the menstrual cycle is a biological process experienced by female athletes, hormonal changes that occur regularly during the cycle can affect physical condition and views on the body's ability to be active (Cassioli et al., 2023). A variety of physical symptoms, such as menstrual pain, fatigue, decreased energy, and mood changes are often associated with fluctuations in the hormones estrogen and progesterone during the menstrual phase (Darjee et al., 2025). These fluctuations, both directly and indirectly, can affect the intensity, duration, and consistency of physical activity carried out by female athletes (Gimunová et al., 2022). Research reveals that athletes' responses to the menstrual cycle are personal, with some athletes able to maintain a high and consistent intensity of physical activity throughout phases of the cycle, while other athletes experience reduced activity due to physical and mental symptoms that arise during menstruation (McNamara et al., 2022). These differences in responses underscore the importance of thorough and continuous monitoring of menstrual characteristics to understand their relationship with physical activity. It is also the foundation for adjusting the intensity of training and mentoring strategies that match the physical condition of female athletes (Vannuccini et al., 2021).

Studies on the relationship between diet and menstrual cycle in female athletes have been increasingly conducted in the past five years, in line with increasing attention to the health and performance issues of female athletes. Recent research shows that diet, especially related to energy availability, plays an important role in supporting the physiological function and hormonal balance of female athletes, although its effect on performance is not always directly apparent (Ihalainen et al., 2024). Low energy availability conditions are reported to have the potential to affect endocrine regulation and menstrual health of female athletes. However, the response to these conditions varies between individuals and is influenced by the ability to adapt to the training load and the competitive experience that the athlete has (Mountjoy et al., 2023). In addition, studies examining nutrient intake based on menstrual cycle phases in female athletes show that changes in energy and macronutrient intake are not always consistent between cycle phases. These findings indicate that the relationship between diet and menstrual cycle is complex and cannot be explained linearly (Miyamoto & Shibuya, 2023). Furthermore, studies in elite athletes found that a decline in performance or perception of physical ability was not always followed by menstrual disorders or hormonal changes, particularly in athletes who had adapted to high training loads and demands (Piñol-Granadino et al., 2025) The

findings confirm that the relationship between diet and menstrual cycle in female athletes cannot be partially understood, but needs to be studied in a multidimensional framework that includes physiological, psychological aspects, as well as the context and intensity of the training that athletes undergo. Therefore, this study exposes how diet, menstrual cycle characteristics, and perception of physical ability among female taekwondo athletes at the university level correlate with each other. The novelty contribution of this research lies in the shift of focus from objective performance indicators and elite athlete populations towards the evaluation of subjective perceptions of physical ability in the context of college sports. In addition, comparisons were made between junior and senior athletes to identify differences in training and competition experiences. Overall, the purpose of this study is to gain a more comprehensive understanding of the interaction between dietary factors and menstrual cycles on the perception of physical ability of female taekwondo athletes in a competitive environment in college.

METHODS

In this study, a quantitative approach is used because it allows an objective analysis process through numerical data processing to statistically and measurably test the relationship between variables (Widiawati et al., 2024). This method was chosen because it provides an opportunity for researchers to formulate hypotheses systematically based on theories, then test the validity of the hypothesis through empirical data collected using standardized instruments (Dos'Santos et al., 2023). As such, the conclusions resulting from this method can be scientifically accounted for.

The aim of this study was to find out how variables such as diet, menstrual cycle, and perception of physical ability relate to each other without intervening or changing the subject's condition. Therefore, a non-experimental correlation approach is used (Slater & Hasson, 2025). The correlational design was chosen because it allowed the observation of the respondents' natural conditions as athletes, such as hormone levels and eating habits could be in accordance with their real circumstances (Miyamoto & Shibuya, 2023). Since variables such as menstrual cycle and nutrient consumption are unethical to be intentionally intervened in experimental studies, this non-experimental design is particularly relevant. Therefore, observational methods combined with statistical analysis are the most appropriate methodological options (Elorduy-Terrado et al., 2025).

In this study, the research population consisted of all female athletes who participated in the Taekwondo Student Activity Unit and actively participated in routine training programs during the study. This is due to the fact that this group has a systematic and consistent pattern of physical activity (Wagner et al., 2025). The sampling method applied is total sampling, where all members of the population who meet the research criteria are used as samples. This is done due to the relatively small size of the population, thus allowing for thorough data collection (Taherdoost et al., 2016). The application of total sampling is considered suitable for studies with homogeneous populations, as this method can improve the accuracy of data representation as well as reduce the risk of bias in sample selection (Giri, 2024). Through the involvement of all eligible female athletes, this study aims to analyze the relationship between research variables (Makwana et al., 2023).

Data collection in this study involved 36 female taekwondo athletes as respondents. All respondents filled in the research instruments in their entirety, so that the response rate reached 100%. Data were collected using the Semi-Quantitative Food Frequency Questionnaire (SQ-FFQ), Menstrual Distress Questionnaire (MEDI-Q), and International Physical Activity Questionnaire-Short Form (IPAQ-SF). **Table 1** presents a description of the characteristics of the research subject according to the level or class of the match.

Table 1. Characteristics of Respondents (female athletes)

Characteristics	Sample		Full Sample	
	n	%	n	%
Level/Class				
Junior	21	58.3	36	100
Senior	15	41.7		

This study applied measurement instruments that were tailored to the participants' procedures and used standard questionnaires that had been tested in various previous studies. Dietary assessment is carried out by Semi-Quantitative Food Frequency Questionnaire (SQ-FFQ), which is designed to detect the type of food and its frequency over a given period, so as to illustrate the general nutritional intake patterns of respondents (Saputri, 2025). Menstrual Distress Questionnaire (MEDI-Q) was applied to evalu-

ate the menstrual cycle, which included the regularity of the cycle, the length, and the menstrual symptoms felt by the respondents. The reporting approach itself is considered to be ethically and practically capable of describing women's physiology (Cassioli et al., 2023). This questionnaire is often applied in active women's health studies and is considered appropriate for non-clinical research that does not require a direct medical examination (Medina-Perucha et al., 2024). As a complement to the measurement, the level of physical activity as an indicator of physical ability is measured using International Physical Activity Questionnaire – Short Form (IPAQ-SF), which assesses the intensity, frequency, and duration of activity over the past week, which is useful to comprehensively describe the level of physical activity carried out by each individual (Dharmansyah & Budiana, 2021). IPAQ-SF is suitable as a measuring tool in this quantitative research, because it has been validated at the international level and has high reliability among athletes and adults (Balboa-Castillo et al., 2023).

The data collection process is carried out through the distribution of questionnaires after the researcher explains the purpose and type of data collected. The literature on survey methodology emphasizes the importance of communicating the research procedure and context to respondents prior to filling out the questionnaire (Zimba & Gasparyan, 2023). All respondents were voluntarily involved and gave consent through informed consent. It is an important component of research ethics that guarantees respondents' rights and protections, including the right to resign at any time without consequence, as stated in the questionnaire data collection ethics guidelines (Al Habsi, 2024).

The collected data will be analyzed using IBM SPPS Statistics Version 26 software. The data was explored to understand how diet, menstrual cycle, and physical activity in female taekwondo athletes based on junior and senior championship levels correlated with each other. To find out how closely the relationship between the research variables is, Pearson correlation analysis is applied. In addition, descriptive statistics that include frequency and percentage were applied to describe the characteristics of the study respondents. The results of the study were interpreted based on the value of the correlation coefficient and the significant level with the confidence level of $\alpha = 0.05$.

RESULTS AND DISCUSSION

Based on **Tabel 1**, most of the respondents in this study were junior athletes (58.3%), while senior athletes comprised (41.7%) of the total sample. This proportion describes the characteristics of the level of taekwondo in the university environment that is the subject of the study. Furthermore, Table 2 displays descriptive statistics as well as Pearson correlation coefficient values for dietary variables, menstrual cycle characteristics, and perception of physical ability, which are used as a basis for evaluating the relationship between variables at each level of competition.

Table 2. The results of the correlation test between the Maka Pattern and the Mesptering Cycle on the Perception of Physical Ability.

Variable	n	M	SD	1	2	3
Junior						
Diet (SQ-FFQ)	21	80,48	50,388	—	—	—
Menstrual Cycle (MEDI-Q)	21	35,71	11,996	0,159	—	—
Physical Activity (IPAQ-SF)	21	4013,41	2494,939	-0,025	0,325	—
Senior						
Diet (SQ-FFQ)	15	1117,33	38,646	—	—	—
Menstrual Cycle (MEDI-Q)	15	39,87	10,042	0,476	—	—
Physical Activity (IPAQ-SF)	15	4167,50	1576,627	-0,181	0,516	—

Note: *significant ($p < 0.05$); ** very significant ($p < 0.01$); not counted.

The pearson correlation analysis summarized in **Table 2** shows that in junior female taekwondo athletes there is no statistically significant relationship between diet, menstrual cycle, and physical activity ($p > 0.05$). The correlation between diet measured using SQ-FFQ and menstrual cycles (MEDI-Q) showed a positive relationship direction with weak strength ($r = 0.159$: $p > 0.05$). Meanwhile, the association between diet (SQ-FFQ) and physical activity (IPAQ-SQ) showed a very weak negative correlation ($r = -0.025$; $p > 0.05$) and the association between menstrual cycle (MEDI-Q) and physical activity (IPAQ-SF) in the junior group also showed a weak positive correlation ($r = 0.325$; $p > 0.05$). Overall, these results indicate that the entire relationship between variables in the junior group did not reach a statistically significant level.

In the senior group, correlation test results showed that the relationship between diet (SQ-FFQ) and menstrual cycle (MEDI-Q) had a positive direction with moderate strength, but did not reach a statistically significant level ($r = 0.476$; $p > 0.05$). The relationship between diet (SQ-FFQ) and physical activity (IPAQ-SF) also showed a negative correlation with weak strength and was not statistically significant ($r = -0.181$;

$p > 0.05$). Different from the two relationships, the analysis showed a statistically significant relationship between menstrual cycle (MEDI-Q) and physical activity (IPAQ-SF) in the senior group with a moderate negative relationship direction ($r = -0.516$; $p < 0.05$).

This study analyzes the relationship between the perception of physical ability of female taekwondo athletes, menstrual cycle, and diet. In the junior and senior groups, the results of the Pearson correlation analysis in Table 2 showed no statistically significant relationship between the three variables. These results suggest that there is no direct correlation between female athletes' perceived physical ability and diet. This conclusion is in line with the idea that various interconnected multidimensional factors affect athletes' physical performance and perception (Elliott-Sale et al., 2021). The results of this study are in line with the meta-analysis conducted by (McNulty et al., 2020), which revealed that changes in the phases of the menstrual cycle do not necessarily have a significant influence on female athletes' performance and physical perception, especially in athletes who have developed physical and mental tolerance to biological changes. In addition, (Bruinvels et al., 2022) confirms that the correlation between variables can be inconsistent when analyzed as a whole due to differences in individual female athletes' responses to menstrual cycles.

The methodological approach put forward by (Elliott-Sale et al., 2021) explains the insignificance of the relationship between diet and perception of physical ability in this study, which highlights that the physical achievements and perceptions of female athletes are influenced by various elements such as, training intensity, physiological, psychological aspects, and the match environment, so it is not easy to explain with just one parameter. In addition, the research conducted (McNulty et al., 2020) supports the finding that female athletes' perceptions and physical reactions to biological fluctuations, such as menstrual cycles, vary widely and are influenced on individual traits and long-term exercise adaptations. In addition, (Oester et al., 2024) It found that female athletes' perceptions of the impact of the menstrual cycle on physical performance varied suggesting that subjective perceptions do not necessarily reflect physically changes or physically activity that can be objectively measured. Therefore, (Findlay et al., 2020) revealed that match experience, expectations, and coping approaches influence female athletes' views of their physical capacity during the training and match stages. Thus, the results of this study reinforce the view that basic correlation techniques are insufficient to comprehensively decipher the complex relationship between diet, menstrual cycle, and perception of physical ability of female athletes (Bruinvels et al., 2022).

Although the study did not find a significant association between the variables studied, the results in the senior group showed a link between menstrual cycles and physical activity involvement. Athletes with higher championship levels have better body awareness and longer training experiences, which makes them more sensitive to physiological changes that occur during the menstrual cycle (McNamara et al., 2022). This awareness can affect the way athletes assess their physical readiness, as well as the way they adjust their participation and training intensity. In addition, the perception of female athletes' physical abilities is influenced by competitive experience and psychological factors, as well as physical conditions. This is due to the fact that psychological variables such as motivation, self-confidence, and self-efficacy show a moderate correlation with overall exercise performance (Ayranci & Aydin, 2025). Therefore, female athletes' responses to the menstrual cycle can be understood as a unique process influenced by the interaction between training experience, psychological preparation, and the capacity to adapt to physical demands.

In interpreting the findings of this study, there are several limitations. First, the cross-sectional design applied in this study limits the ability to observe dynamic changes in diet, menstrual cycle, and physical activity over time. This design also inhibits the determination of causal relationships between variables, as shown by the results of similar studies using this method (Mz & Arovah, 2023). Second, self-report instruments such as SQ-FFQ, MEDI-Q, and IPAQ-SF can cause report bias. This empirical research shows that estimates of physical activity based on self-reports can be very different from measurements with objective tools such as accelerometers (Lines et al., 2020). Third, these findings were not generalized to the broader population of female athletes because the sample size was limited and only taken from one student activity. This is due to the fact that external validity is greatly influenced by sample representativeness sampling techniques. Therefore, these findings need to be carefully interpreted, and further research is recommended to be conducted longitudinally, using a combination of larger and more diverse sample sizes, and using a combination of objective and subjective measurements. The main objective of this study is to improve the external validity as well as the

accuracy of physical behavior estimates by implementing a more sustainable design. (Degtiar & Rose, 2023).

Although this study did not find a meaningful relationship between the variables studied, the findings still have an important impact on the development of research on female athletes. Theoretically, the results show that the assessment of female athletes' performance and outlook requires a comprehensive method, which takes into account not only physical factors, but also psychological aspects, sleep patterns, as well as reactions to competitive pressures (Nijenhuis et al., 2024). Recent research reveals that sleep quality is essential for athletes' recovery and abilities; Sleep disorders have an impact on physical and cognitive function, which impacts the endurance of overall physical abilities (Kaczmarek et al., 2025). In addition, research on the link between mental toughness and the quality of sleep of athletes reveals a close relationship between psychological elements and physical preparation. This emphasizes the importance of including psychosocial aspects in the study of women's sports performance (Chen et al., 2024). In practice, coaches and athletes are encouraged to not only focus on aspects of physical health, such as maintaining nutritional patterns and menstrual cycles, but also to think about strategies to reduce stress, improve sleep quality, and support athletes' mental adaptation (Cunha et al., 2023). For further research, the application of longitudinal designs, larger samples, and combined methods involving quantitative and qualitative approaches is recommended. In addition, to get a better idea of the dynamics of relationships between variables, as well as to deal with individual differences in physiological and psychological responses (Thompson et al., 2024).

CONCLUSION

Based on the results of the study, these findings indicate that diet and menstrual cycle characteristics do not show a meaningful association with physical activity levels in female taekwondo athletes. There was no meaningful relationship between athlete-informed diet and menstrual cycle characteristics. These findings show that the menstrual condition of female athletes in this study is not necessarily directly related to the athlete's food consumption patterns. In addition, variations in the intensity of physical activity performed are also not necessarily related. The findings of this study also reveal that the menstrual cycle does not show a meaningful correlation with the intensity of physical activity of female athletes. As a result, differences in athletes' menstrual cycles do not directly affect their daily physical activity levels. Overall, the results of this study indicate that the relationship between diet, menstrual cycle, and physical activity level is very complex and can be affected by various additional factors beyond the observed variables. These findings indicate that the relationship cannot be explained semantically through simple correlation.

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