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Does the duration's training and menstrual cycle phase affect women's futsal athlete performance? A critical survey perspective

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Abstract

The menstrual cycle phase and the duration of practice often interfere with female futsal athletes' performance during training. This study explores the relationship between exercise duration, menstrual disorder and the performance of women's futsal athletes. This research method uses a survey. The subjects of this study were 22 female futsal athletes in the city of Cimahi. The instrument was a closed interview validated by a women's soccer expert (coach of the Indonesian women's soccer team) from STKIP Pasundan and tested on three participants who met the inclusion criteria. Descriptive analysis is presented as the mean and differences between groups were evaluated by t-test with a statistically significant level of $p < 0.05$. Descriptive analysis using SPSS software (version 21.0). This study reveals that the significance test with sig.0.13 <0.05 on the duration variable, which means that the exercise's duration directly affects the athlete's performance. In comparison, the menstrual cycle variable has a sig.0.91 value > 0.05, which means that the menstrual cycle does not directly affect the performance of female futsal athletes. However, the significant results showed no effect of the menstrual cycle on the performance of female futsal athletes. This study recommends that female futsal coaches pay attention to the duration of training during the menstrual period for each athlete to achieve optimal performance.

Keywords: Exercise duration, menstrual disorder, futsal performance.

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INTRODUCTION

Research reports in western cultures regarding menstruation and premenstrual syndrome (PMS) mostly lead to the correlation between menstruation and elite athlete performance and its impact (Prince et al., 2022). Research to explore the internal or external factors that affect women's or girls' participation in sports, particularly at the elite athlete level while they had menstruation cycles and how menstruation exercises are

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managed in training settings has often gone unstudied (Schaumberg et al., 2013). Women differ from men in anatomy, psychology and physiology (de Jonge et al., 2019). This situation places women in advantageous and disadvantageous situations in the context of elite sports (athletes) because women have irregular menstrual cycles that are sometimes regular every month or irregular, directly impacting their psychology (Ravi et al., 2021).

Hormone system that controls the menstrual cycle in women. Generally, this cycle will begin when a woman turns 12-13 years old (Arazi et al., 2019). Menstruation is a period of life resulting from the evolution of a woman's ovarian function. Menstrual cycle in a female who often does sports more regularly than those who do not. It is also often associated with performance (Czajkowska et al., 2019; Schmitt et al., 2021). Amenorrhea disorder is often associated with strenuous and long-term exercise related to the menstrual cycle in a female athlete (Meignié et al., 2021). Aerobic endurance and other psychological factors, such as self-confidence, have a negative impact when a female athlete enters the premenstrual stage every month

Research on menstruation in the performance of female soccer athletes reveals that during menstruation, women experience a lot of blood deficiency which causes iron deficiency and anaemia. The felt impact results in weakness and excessive fatigue, which can reduce aerobic endurance. This is also related to decreased athlete performance (Pinel et al., 2022). A change in the prevalence of amenorrhea of 60-79% is associated with the intensity and duration of physical activity in some female athletes when they enter the menstrual cycle and afterwards. In contrast, there is no difference experienced by some menstruating women in terms of other aspects of emotional and psychosocial changes (Ozbar et al., 2017).

Menstrual dysfunction, such as primary amenorrhea or menarche and others related to these, have always been associated with the performance of a female athlete (Brown & Knight, 2022). During the menstrual cycle, there is no visible decrease in athlete performance.

However, towards the beginning of the menstrual cycle, which usually comes with pain and can be seen by some people, there is a decrease in performance. In this case, menstruation does not prevent sports or competitions that should be (Clarke et al., 2021). Cyclical fluctuations of estrogen and progesterone during the menstrual cycle, which can affect athlete performance, are influenced by several mechanisms. By increasing muscle glycogen storage and increasing fat utilization, changes in substrate metabolism will affect estrogen, which is considered an anabolic effect on skeletal muscle (Meignié et al., 2021). In addition, progesterone is considered to get anti-estrogenic effects (Senatore et al., 2019). Thus, it makes sense that sports performance can change and can be observed during the menstrual cycle due to different hormones (McNulty et al., 2020).

Previous research on women's soccer athletes revealed the potential for women's physiological changes during the menstrual cycle. It can be assumed that this can cause changes in the physical ability of a female athlete even though, all populations are classified as healthy, athletes' standards range from physically active students and sports students to trained individuals (Viegas et al., 2021). This study reinforces the effect of physical activity on women's physiology, and reports reveal that various menstrual cycle disturbances are felt in women who practice various sports. This disorder is often felt when much blood comes out while he has to train with a high enough load so that it can affect emotional stability, and of course, this is also influenced by other factors such as weight and diet (Czajkowska et al., 2019). Physiologically, prolonged exercise and competition can affect a deformed luteal phase or irregular menstruation, thereby impairing ovarian activity (Mikaeli Anne Carmichael et al., 2021). This disorder is always accompanied by decreased estradiol and progesterone levels in the blood during menstruation.

Further research is needed on the performance of athletes in sports with the influence of sports activity on the duration of exercise. Similar to football, futsal is also one sport of masculinity that women can play.

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Therefore, all aspects of the psychological patterns experienced by soccer athletes are the same as futsal athletes in women (Caso & Kamp, 2020).

The relationship between exercise and symptoms related to the menstrual cycle has been less studied so far, and there are gaps in the literature, such as the main physical and mental symptoms and their effect on sports performance coupled with the intensity of exercise performed during menstruation (Lima-Trostdorf et al., 2021). This study seeks to reveal the relationship between exercise duration, menstrual disorder and athlete performance in futsal.

METHOD

The survey research follows steps that have been carried out in previous research (Malliaropoulos et al., 2014) to increase the validity of this research includes a women's soccer expert who is also active in Indonesian women's futsal organizations, namely one of the lecturers at STKIP Pasundan who guided and developed this research. Before the survey was carried out using existing instruments, as many as three non-sample futsal athlete participants were tested. After the trial, experts conducted a survey before being reviewed to ensure content validity regarding anthropometric data, exercise duration, and menstrual cycles, which can describe menstrual disorders (Mikaeli A. Carmichael et al., 2021) and also performance. Examples of questions regarding the duration of practice are: "how many times does exercise last a week?"; menstrual cycle: "How many times have you menstruated in the last year?"; Performance: "Does menstruation interfere when you want to show your best performance in competition?". The female futsal athlete answered 19 questions listed on the closed interview sheet for 10 minutes (Pinel et al., 2022).

As many as 22 female futsal athletes from Cimahi were involved in this study. All athletes who were sampled in this study had stated their willingness to be involved in this study by attaching a letter of agreement. Sampling was carried out by purposive sampling by only taking students who became professional athletes in West Java. The students taken as

the sample were 18-20 years old on average. The questionnaire was distributed via Google form and shared directly by their trainers using WhatsApp. It took six days to collect all the results from closed interviews, which previous researchers usually conducted to reveal the link between the menstrual cycle and performance (Meignié et al., 2021) provided directly by the trainer with the help of a google form. These futsal athletes completed closed-door interviews regarding BMI data, menstrual history, disorders they experienced and performance during the competition (Rauh et al., 2018). The average BMI of women's futsal athletes is 21.5 kg by entering the normal range criteria that fall into the standard range of 18.5-22.9.

Data were analyzed descriptively to summarize the basic characteristics of age, BMI, exercise duration, menstrual disorder and performance of female futsal athletes who completed the survey. Body mass index (BMI) is calculated by height (m) and weight (kg) which is measured as mass/height. BMI is used as descriptive anthropometric data to classify the results of the relationship between training duration, menstrual disorders and performance of female futsal athletes (Czajkowska et al., 2019). Descriptive data are presented as the mean, and differences between groups were evaluated by t-test with the level of statistical significance being $p < 0.05$. Descriptive analysis and performed using SPSS software (version 21.0).

RESULT

The data obtained are described first to determine the anthropometrics of all samples. Table 2 presents anthropometric data for all samples. The average age of female futsal athletes is 19 consecutive years. Meanwhile, the average height is 152.5 cm, and the body weight is 50.3 kg. Then the data were analyzed to see the relationship between exercise duration, menstrual disorders and the performance experienced by athletes when they experience menstruation.

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Table 1. The relationship between training duration, menstruation and the performance of female futsal athletes

	Variable	R	p-value
Performance	Exercise Duration		
	1	-0.12	0.11
	1.5	0.16	0.61
	2	0.23	0.009*
	>2	0.20	0.18
	Total Menstruation in 1 year		
	0-4	0.03	0.21
	5-8	0.09	0.55
	9-11	0.43	0.021*
	12-15	0.21	0.68
	>15	0.10	0.32

The data in table 2 illustrates the results of the correlation of training duration, menstruation and women's futsal athlete performance. The results of the analysis show that the R-value on the duration of exercise experienced by athletes with a duration of training of 2 hours per day has a value of R = 0.23 and p-value = 0.009 with a p-value <0.05, the hypothesis is accepted, meaning that there is a correlation to the duration of training 2 hours when experiencing menstruation on athlete performance. The results show that when the number of menstruation for female futsal athletes for one year is 9-11 times, it is still in the normal category, which has a value of R = 0.43 with a p-value = 0.021 with a p-value <0.05, the hypothesis is accepted, meaning that there is a correlation to the number of menstruation in one year on athlete performance.

Table 2. Significance test between duration, menstrual cycle and performance of female futsal athletes

		Unstandardized Coefficients		Standardized Coefficients		
Model		B	Std. Error	Beta	t	Sig.
1	(Constant)	54.693	11.349		4.819	.000
	Duration	-5.894	2.139	-.537	-2.755	.013
	Menstrual cycle	.002	.018	.025	.127	.901

a. Dependent Variable: Performa

b. Weighted Least Squares Regression - Weighted by BMI

The table shows that the significance test with sig.0.13 <0.05 on the duration variable, which means that the duration of the exercise directly

affects the athlete's performance. The menstrual cycle variable has a sig.0.91 value > 0.05, which means that the menstrual cycle does not directly affect the performance of female futsal athletes.

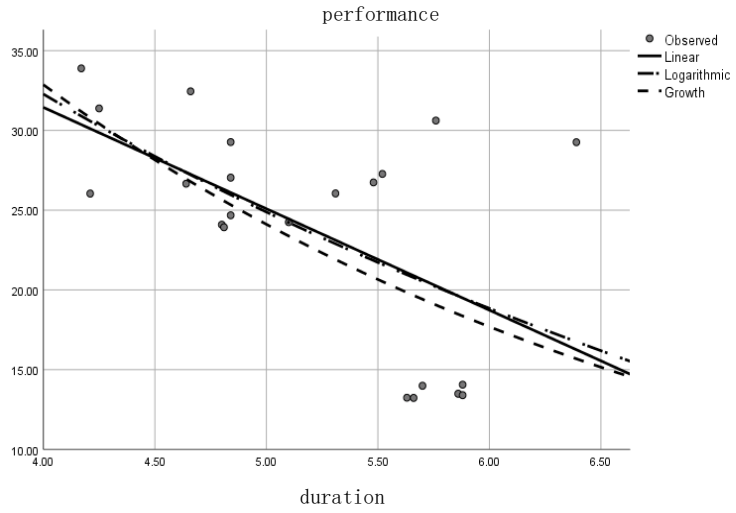

Figure 1. Interaction between exercise duration, menstruation and athlete performance

Figure 1 presents the interaction between the two variables with the performance of female futsal athletes. Linear interactions occur in exercise duration, menstruation and athlete performance with a value of F=28.5. It can be seen from the picture that all three have interactions with lines that intersect with each other, even though the results of the significance test on the menstrual cycle variable have no significant effect.

DISCUSSION

Based on the results of this study, it is revealed that there are differences between duration, menstrual cycle and performance of female futsal athletes. However, the difference was not significant in the menstrual cycle. This study shows that the duration of training affects the performance of athletes and not because of menstruation. Recent research has shown that the response to physical exercise can be increased in female athletes if it is adjusted to the menstrual cycle they are experiencing, even at moderate to heavy training intensity (Lee et al., 2020). Two important findings in this research revealed a correlation between the duration of exercise experienced by an athlete when

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practising every day during menstruation with performance and the correlation between menstrual disorders experienced by athletes marked by the duration of menstruation in one year with the performance shown when competing. In accordance with previous studies, female elite futsal athletes will continue to exercise at moderate to high intensity to achieve their best performance, even though they are menstruating (Arazi et al., 2019; Armour et al., 2020; Schaumberg et al., 2013). Elite athletes' menstrual cycle and training response can then provide significant performance gains (Julian et al., 2021).

The biological effects of menstruation occurring in women are uncomfortable feelings and emotional expressions about themselves and sometimes sociocultural aspects of participating in training to achieve the best performance (Prince et al., 2022) being one of the factors. The use of the menstrual cycle to optimize training and performance while reducing injury has been described. For elite athletes, strength training is more beneficial during the first menstrual cycle because the body can adapt and recover better (Oleka, 2020). The menstrual cycle does not affect performance during competition negatively in elite athletes because everyone has a different situation. Moderate to high-intensity training to prepare for pre-competition, during and after, supports female athletes' performance (Ozbar et al., 2017). The feeling of comfort and pain when you are in the first menstrual cycle and other effects often associated with impaired concentration during exercise are not the only contributing factors that can affect performance, but these symptoms are all triggered by unstable hormones (Bae et al., 2018).

The performance of female elite athletes will be affected by the duration and intensity of the training, even whether they are menstruating (Clarke et al., 2021). Coaches must be aware of the health impacts and potential performance disturbances when athletes are menstruating, including a greater likelihood of experiencing an injury, iron deficiency, and other cardiovascular function disorders (Czajkowska et al., 2019). Similarly, even in the absence of dysfunction, understanding the

relationship between an individual's menstrual cycle phase and performance, training as it relates to training duration, and recovery after exercise can improve training interpretation (Senatore et al., 2019). Futsal is not the only sport affected by problems regarding physical contact between fellow players, but those who play are women, so problems related to their physiology and society will have an effect. Women are often subject to social pressure to hide their periods and will change activities to hide their symptoms when too much blood comes out. However, this is not always possible for athletes, giving rise to concerns and distractions that will impact performance (Mikaeli Anne Carmichael et al., 2021).

Menstrual pain elite athletes find one of the most challenging aspects of managing their emotions during this period. Menstrual cramps during the training process are common for many female athletes every month and often make it difficult to focus while training (Meignié et al., 2021). Increased production of the hormone prostaglandins is associated with uterine cramps and is considered a cause of dysmenorrhea. The performance of elite female futsal athletes during menstruation or not will still be affected by the intensity and intensity of the training (Meignié et al., 2021). A decrease in menstrual cramps can also be attributed to increased endorphins produced during prolonged physical activity that fight pain. Some women say their pain decreases when exercising regularly (Modena et al., 2022). Menstrual cycle dysfunction, such as heavy menstrual bleeding, also impacts health and performance reported by only 37% of female elite runners and rowers reporting heavy menstrual bleeding but not directly related to performance (Findlay et al., 2020).

However, when they focus on training and their goal is to achieve, the pain and cramps sometimes disappear because of ambition (Kelland et al., 2017). This fact may be influenced by external factors such as an empathetic coach, which may positively impact athlete performance and implies the need for coaches and athletes to work together to achieve predetermined goals (Rosen et al., 2022). The coach's relationship with

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these athletes might strengthen the determination of a female athlete who is experiencing menstruation by convincing them that female athletes do not feel the disturbances experienced during menstruation, such as abdominal pain and cramps (Höök et al., 2021). With this, athletes perceive the coach as someone trusted and reliable to improve their performance.

Previous studies did not report a significant effect of complaints felt during menstruation on athletes' performance during the competition (Brown et al., 2021). An athlete's overall performance can be influenced by psychological, perceptual and physical factors (Brown & Knight, 2022). when in the menstrual cycle, the body's physiology functions better when compared to non-menstrual periods. Changes in performance that are greater when athletes experience menstruation indicate that impulsivity is significantly influenced by the menstrual cycle phase (Modena et al., 2022).

The study's results revealed that the performance of athletes when competing was influenced by the pattern of menstruation experienced by female athletes. There are several factors in this regard, one of which is the psychological factor that coaches must consider during practice (Bae et al., 2018). Therefore, to optimize training and emotional management in female athletes during menstruation for further research to measure the impact of menstrual cycle phases on perceived and physical performance to identify factors that influence the variability of performance in elite female athletes during menstruation.

Despite the results disclosed, some limitations need to be acknowledged. First, the sample in this study was only elite female athletes who practised team sports only in futsal branches. For this reason, further studies should include representatives of elite female athletes who practice other contact and non-contact team sports, individual contact sports (eg, karate and judo), and non-contact individual sports (eg, gymnastics). Second, we have only focused our attention specifically on the menstrual period, but future research should also

consider specific strategies that elite female athletes can use to manage symptoms caused by and associated with other phases of the menstrual cycle, for example, the menstrual period itself.

CONCLUSION

Menstruation in female athletes with monthly menstrual cycles and the impact felt by athletes during menstruation to optimize training and performance. This study explores the response of elite female athletes in the sport of futsal with training duration and symptoms/problems of the menstrual cycle to performance. The results highlight the response to and importance of monitoring the menstrual cycle with symptoms impacting performance in competition. The menarche age is high in female futsal athletes, physical performance is not affected by menstrual periods, and pain is reduced during training and competition. Although their average BMI is normal, they practised regularly and still have normal menstruation.

The findings of this study recommend the need for a team such as medical experts and psychiatrists to be able to discuss directly with athletes the emotional impact felt when experiencing menstruation which will affect when showing their best performance when practising or competing. This is done to minimize negative impacts and maximize positive outcomes for their performance.

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