Теорія та методика фізичного виховання
Physical Education Theory and Methodology
Teorìâ ta Metodika Fizičnogo Vihovannâ

ISSN 1993-7989 (print)
ISSN 1993-7997 (online)
ISSN-L 1993-7989

Original scientific article

Determining the Impact of Menstrual Cycle on Collegiate Athletes: Self-reported Health Issues, Sports Performance, and Willingness to Discuss Regarding Menstruation

Yetty Septiani Mustar[1ABCDE], Bayu Agung Pramono[2BCD], Febby Alfu Khoirun Nissa[1BCD], Indra Himawan Susanto[1ABE], Anna Noordia[1ABE] and Dita Yuliastrid[1ABE]

[1]Universitas Negeri Surabaya

Authors' Contribution: A – Study design; B – Data collection; C – Statistical analysis; D – Manuscript Preparation; E – Funds Collection

Corresponding Author: Yetty Septiani Mustar, E-mail: yettymustar@unesa.ac.id
Accepted for Publication: July 10, 2024
Published: August 30, 2024

DOI: 10.17309/tmfv.2024.4.03

Abstract

Background. Gaining a comprehensive understanding of the menstrual cycle, its associated health concerns, and the subsequent effects on athlete performance could facilitate the formulation of educated and tailored strategies for training and participating in competitive sports. In turn, this can decrease the probability of injuries, maintain psychological well-being, and ultimately enhance athlete performance.

Objectives. The study aimed to investigate the perspective of collegiate student-athletes related to health issues and sports performance during their menstrual period, both in terms of training and competition, as well as the athletes' willingness to discuss pertaining their menstrual cycle.

Materials and methods. Our study included 115 female student-athletes participating in land-based individual/team sports (n = 95) and a combination of land/water-based sports (n = 20). A questionnaire was used to collect data for this cross-sectional study, which was undertaken and completed by the participants. A descriptive analysis was performed, with results reported in frequency and percentage, followed by the Wilcoxon rank-sum test (Mann-Whitney) to analyze the mean differences between the training participation groups during menstruation.

Results. In general, all athletes experienced several health issues, with abdominal pain and lower back pain being the most prevalent. Furthermore, nearly all of them (95.33 %) experienced pain on the first day of their periods. Menstruation also influences the performance of female athletes during exercise (70.43 %) and competition (73.91 %), causing increased fatigue and reduced endurance in the majority of them. Additionally, there is a significant difference between the context of training engagement and the number of weekly exercise sessions (0.011) during the menstrual cycle.

Conclusions. Menstruation significantly affects the health and performance of female athletes, both during training and competition. Coaches and athletes must comprehend the menstrual cycle to address this issue effectively. It is crucial that coaches and athletes possess a comprehensive understanding of the menstrual cycle in order to effectively address this issue. Moreover, involving medical professionals and sports nutritionists in managing menstrual cycles is also another strategy for enhancing athlete performance.

Keywords: period, health concern, follicular phase, female athletes, exercise, competition.

Introduction

In recent decades, there has been a notable rise in female involvement in sports, including a spectrum ranging from physical activity to participation in elite athlete competitions, which can be attributed to heightened efforts and resources dedicated to the advancement of women's professional sports (Fink, 2015; Forsyth & Roberts, 2018). This is evidenced by the significantly increased number of women's participation in competing in the Olympics, by 34 % of the total participants at the 1996 Olympics in Atlanta, then increasing to 45 % at the 2016 Rio Olympics, and it is estimated to reach 48.8 % at the Tokyo 2020 Olympics (International Olympic Committee, 2020).

Physical activity or exercise can decrease anxiety and depression (Mikkelsen et al., 2017), cardiovascular fitness (Lavie et al., 2015), reproductive health (Harrison et al., 2016; Orio et al., 2013), including decreasing weight for both men and women (Caudwell et al., 2014; Swift et al., 2014). However, women in sports are sometimes side-lined because they are considered more challenging to learn than men due to their higher levels of hormonal complexity (Holtzman & Ackerman, 2021). It is due to the physiological differences between men and women in terms of menstrual cycles, which are under the control of the hormonal system, and this cycle affects various aspects of health, well-being, and sports performance (Lebrun, Joyce, & Constantini, 2013; Mountjoy et al., 2014; Ön, Diker, & Özkamçi, 2014). The menstrual cycle has been reported as an essential biological rhythm affecting female reproduction and is also considered for optimizing exercise, enhancing athletes' adaptive responses (Julian & Sargent, 2020), and athlete performance (Oosthuyse & Bosch, 2010). Constantini et al. (2005) identified a number of exercise performance parameters—including metabolic, respiratory, cognitive function, cardiovascular, orthopaedic, and response to ergogenic aid—that are affected by the menstrual cycle, which affect both aerobic and anaerobic strength and overall performance during exercise.

In a part of a review related to the literature on the impact of physical activity on women's physiology, research conducted by Loveless (2017) and Meczekalski (2014) emphasizes that the majority of women who are menstruating and performing several types of exercise experience an assortment of menstrual cycle disorders. This indicates that the menstrual cycle negatively impacts both physically and psychologically women's lives and daily activities (Mountjoy et al., 2014). Furthermore, this finding aligns with the research reported by Findlay et al. (2020), which reveals that 51 % of athletes perceive menstruation as an impediment to their training and performance, and 93 % of female athletes experience adverse physical and psychological symptoms associated with their menstrual cycle. Specific instances indicate that approximately 75 % of women in their reproductive years' experience menstrual discomfort; this condition is particularly prevalent among young women; it is also experienced by approximately 90 % of Australian adolescents who experience menstrual pain (Parker, Sneddon, & Arbon, 2010; Subasinghe et al., 2016). Additionally, 58 % of teenage volleyball athletes also experience pain prior to the onset of menstruation, while 66 % following menstruation (Wodarska et al., 2013).

During the premenstrual and menstrual phases, estrogen and progestin levels decrease, resulting in psychological alterations, in particular irritability, and depression, along with unpleasant physical symptoms like breast tension and abdomen pain, which have been found to have a detrimental impact on sports performance (Prado Seoane, 2013). The fluctuations in estrogen and progesterone levels during the menstrual cycle have a wide range of intricate and multifaceted impacts on many physiological systems, including cardiovascular, pulmonary, metabolic, and neuro-muscular components (Ansdell et al., 2019). Hence, understanding the menstrual cycle's impact on women's sports is essential for athletes and coaches to do the right exercises and ensure optimal health and well-being (Knowles et al., 2019).

Notwithstanding numerous challenges faced by female athletes during their menstrual cycle and the fact that the gender gap has decreased in sports participation, women are still underrepresented (4-13 %) in scientific research on sports health or sports medicine (Bruinvels et al., 2017; Costello, Bieuzen, & Bleakley, 2014; Cowley, Olenick, McNulty, & Ross, 2021), and urgently require for further investigation (Carmichael, Thomson, Moran, & Wycherley, 2021), particularly among student-athletes. Therefore, this study examined the perspective of collegiate student-athletes related to health concerns and sports performance during their menstrual period, both in terms of training and competition, as well as the athletes' willingness to discuss pertaining their menstrual cycle.

Materials and Methods

Study Participants

Our cross-sectional study utilized a convenience sample to recruit participants from a several universities in Indonesia. Only student-athletes who have competed at the regional, national, and international levels were included in this study. We excluded data from respondents (n = 6) who were not student-athletes based on the criteria and data cleansing procedure. Hence, 115 student-athletes qualified participated in this study.

Study Organization

This study's questionnaire instrument consisted of four sections: socio-demographics (information pertaining to age, sports, duration of practice in one week, duration of practice per day, the cumulative number of menstruations in a year, participation in training and competition during the menstrual period, level of competition, medals won during menstruation, menstrual cycle, and medication usage during menstruation both in the time of training and competition, were included); the perspective of student-athletes regarding health issues experienced during menstruation. Furthermore, a questionnaire regarding the impact of menstruation on their performance which includes what aspects of training or competition are impacted by menstrual symptoms, including training modifications based on menstruation, as well as information regarding with whom they feel sufficiently at ease to discuss their menstrual cycle which adapted from research conducted by Armor et al. (2020) nutrition, skills and tactics. This questionnaire was distributed over WhatsApp to individuals and groups, with a link to the survey's URL.

The participants were then instructed to complete the self-administrated online questionnaire independently. Furthermore, participants were given detailed instructed to read the questions attentively and answer them according to their condition. It was highlighted that the respondent should select the answer deemed most appropriate based on their assessment related to health issues during menstruation and their sports performance. Additionally, we also remind the participants that there are no right or wrong answers. This study took about 15 to 20 minutes for participants to complete the questions.

Statistical Analysis

In this study, we employed Microsoft Excel to collect and clean data. Subsequently, Stata (version 14) was used to perform statistical analysis. The descriptive data are

reported in frequency and percentage and displayed in tables and graphs afterwards. The Wilcoxon rank-sum test (Mann-Whitney) was then used to examine the mean differences between the training participation groups during menstruation, with a significance level of p = 0.05.

Results

Socio-demographic characteristics

Table 1 outlined that the participants in this study were female collegiate-student athletes, with a large number of their ages ranging from 20 to 23 years (73 %), height 150 to 160 cm (67.83 %), body weight 50 to 59 kg (53.91 %), and having a normal body mass index (75.65 %). Most of the student-athletes participated in team sports (land-based), exercised three to four times per week, and duration of their daily exercise for one to two hours per day, with a proportion of the participants 51.3 %, 65.22 %, and 77.39 %, respectively.

Furthermore, the majority of female athletes (67.83 %) experienced menstruation between 12 and 15 times per year, 66.96 % of participants had regular menstrual cycles, and 46.09 % routinely engaged in high-intensity exercise during their menstrual periods. Nearly all athletes also (93.04 %) encountered pain either right prior to their periods (88.79 %) or on day one of their periods (95.33 %), and most of them reported do not take menstrual pain relievers (80.87 %) or taking medication to delay menstruation (82.61 %), while a minority of them (6.09 %) utilize medicine to delay menstruation who are combination (water-based) athletes. Moreover, the majority of participants engaged in training (58.26 %) and competitions during menstruation (65.22 %) and won medals (61.74 %) in most regional competitions (60.87 %).

Health issues among collegiate student-athlete during menstruation

The most common health concerns experienced by female collegiate student-athletes during menstruation were feeling abdominal pain/pain in the lower abdomen, lower back pain, feeling tired/easily tired, mood swings, and headache/dizziness, with a percentage of the participants 86.09 %, 66.09 %, 28.70 %, 22.92 %, 12.17 %, respectively (Fig.1).

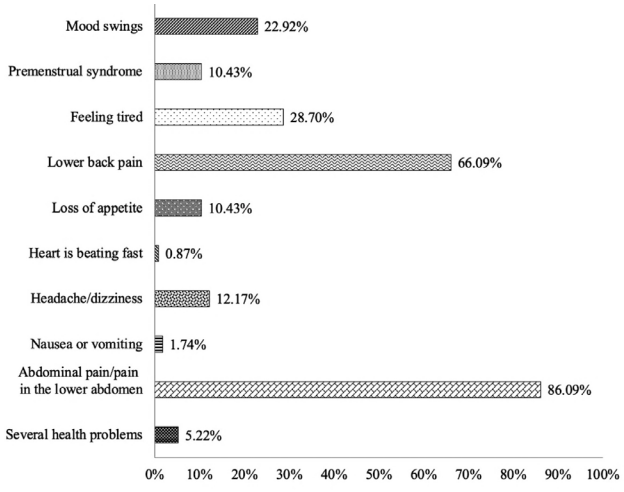

Fig. 1. Self-reported health issues encountered by student-athletes

Table 1. Socio-demographic characteristic of participants

Variables	N = 115	
	n	%
Age (year)		
16-19	31	27.0
20-23	84	73.0
Boddy Mass Index (BMI)		
Normal	87	75.65
Underweight	15	13.04
Overweight	13	11.30
Sport activity		
Team sport (land-based)	59	51.3
Individual sport (land-based)	36	31.3
Combination (water-based)	4	3.5
Combination (land-based)	16	13.9
Number of exercises in a week (days)		
3-4	75	65.22
5-6	40	34.78
Duration of daily exercises (hours)		
1-2	89	77.39
> 2	26	22.61
Cumulative number of menstruations in a year (times)		
5-8	1	0.87
9-11	36	31.30
12-15	75	67.83
Menstrual cycle		
Regular	77	58.26
Irregular	38	41.74
Menstrual cycle during high-intensity exercise		
Regular	53	66.96
Irregular	62	33.04
Menses pain		
Yes, with each period	107	93.04
No	8	6.96
Pain incidence*		
Day one of my menstrual	102	95.33
Right prior to my period beginning	95	88.79
Day two of my menstrual	98	91.59
My entire period	12	11.21
The third day of my menstruation and subsequent	9	8.41
Taking menstrual pain relievers		
Yes	22	19.13
Not	93	80.87
Medication usage to delay menstruation		
Yes	4	6.09
Not	96	82.61
Sometimes	15	11.3
Participating in training during menstrual period		
Always	67	58.26
Sometimes	48	41.74
Participating in competition during menstrual period		
Always	75	65.22
Sometimes	40	34.78
Medal during period		
With medals	71	61.74
Without medals	44	38.26
Competition level		
Regional	70	60.87
National	40	34.78
International	5	4.35

* Several responses are permitted and can contribute more than 100%

Menstrual cycle and athlete performance

The occurrence of menstruation presents unique challenges for female athletes. Our study revealed that most respondents reported being negatively affected by their performance both during training (70.43 %), competition (73.91 %), and commonly in the time of their period. They also feel tired more easily / have less endurance both during exercise and competition. However, only twenty-five athletes were willing to alter their exercise during the menstrual cycle, and twenty-four athletes intended to change their schedules with their coaches (Table 2).

Table 2. Impact of menstrual cycle on performance

The influence of menstruation on athlete performance	n	%
During exercise	n = 115	
Yes – negatively affected	81	70.43
No, I do not see any distinction	34	29.57
Part of the cycle affects exercise*		
During my menstrual cycle	81	70.43
A day or two before menstruation	60	52.17
One to two weeks preceding the onset of menstruation	30	26.09
Part of exercise is negatively affected*	n = 81	
Perceive lacking strength/unable to lift substantial amounts of weight	15	18.51
Experienced less coordinated or clumsier	10	12.35
Tired more easily/have less endurance	35	43.21
Can't concentrate on the instructions or tactics given by the coach during the match	8	9.88
Experience a lack of swiftness in activities that require rapidity	38	46.91
There exists a disparity in my energy levels	25	30.86
Worried that there will be blood stains on clothes/uniform	9	11.11
During competition	n = 115	
Yes – negatively affected	85	73.91
No, I do not see any distinction	30	26.09
Part of the cycle affects competition*		
During my menstrual cycle	85	73.91
A day or two before menstruation	50	43.48
One to two weeks preceding the onset of menstruation	39	33.91
Part of the competition is negatively affected*	n = 85	
Perceive lacking strength/unable to lift substantial amounts of weight	25	29.41
Experienced less coordinated or clumsier	12	14.12
Tired more easily/have less endurance	65	76.47
Can't concentrate on the instructions or tactics given by the coach during the match	27	31.76
Experience a lack of swiftness in activities that require rapidity	7	8.24
There exists a disparity in my energy levels	55	64.71
Worried that there will be blood stains on clothes/uniform	35	41.18
Changing exercise during the menstrual cycle	n = 115	
No, neither I nor my coach will	66	53.79
Yes, I'm disposed	25	21.74
Yes, the coach and I both plan it	24	20.87

* Responses are allowed more than one and can add more than 100%

Discussing menstruation of student-athletes

The majority of the 115 respondents (53.91 %) claimed they exclusively discuss menstruation with female coaches/managers (59.68 %). A minority of female student-athletes (40.32 %) did not address menstruation with their coach or any senior because they did not feel the need to do so (64.15 %) since their performance was unaffected. Also, three athletes said there was no easy or discreet method to connect with their coaches, and two believed they could not assist. Nevertheless, a considerable proportion of athletes (63.48 %) did not discuss their periods with medical personnel (Table 3).

Training participation group during menstrual cycle

The differences in exercise involvement among female student-athletes during their period are presented in Table 4.

Table 3. Discussion pertaining to the menstrual cycle

Discussing menstrual period	n	%
Discuss with the coach or anyone senior on the team about menstruation		
Yes	62	53.91
Not	53	46.09
With whom do you talk about menstruation	n = 62	
I will inform my coach/trainer/manager	25	40.32
Only a female coach/trainers/managers	37	59.68
Why not discuss your period with your coach?*	n = 53	
Embarrassed	12	22.64
Disgrace because they are male	17	32.08
Do not believe they will comprehend	5	9.43
Because they were males, I didn't believe they would comprehend	27	50.94
As the performance was unaffected, there was no need to inform the coach	34	64.15
Consider that they won't care	23	43.40
Thought they wouldn't care because they were boys	21	39.62
There is no easy or secret method to communicate with them	3	5.66
It is uncontrollable, so we must simply adapt	7	13.21
It is irrelevant to them	9	16.98
Believe they are unable to assist	2	3.77
Consult a medical practitioner regarding your period	n = 115	
Yes	42	36.52
Not	73	63.48

* Several responses are acceptable and can contribute over 100%

Due to the non-normality of the data regarding exercise time per day and exercise frequency per week, the Wilcoxon rank-sum (Mann-Whitney) test was utilized. On the basis of exercise participation, specifically the frequency of exercise per week, there were significant differences between the sample groups ($p = 0.011$).

Table 4. Differences in the training participation group of female student-athletes during menstruation

Indicator	Exercise participation		p-value
	Always	Sometimes	
Exercise duration per day (hours/day)	2.18 ± 0.38	2.02 ± 0.44	0.063
Exercise frequency per week (day/week)	4.31 ± 1.26	3.71 ± 0.92	0.011*

Discussion

Menstruation is particularly significant to observe due to the variations of the four primary female sex hormones: estrogen, progesterone, follicle-stimulating hormone, and luteinizing hormone during the period (Maged et al., 2017; Romero-Moraleda et al., 2019). This sex hormone is one of the determinative factors of biological sex (Kinsley, Bardi, Neigh, & Lambert, 2016), which distinguishes between sexes (Elliott-Sale et al., 2020). Furthermore, Meignié et al. (2021) also conveys that more longitudinal and prospective research is urgently necessary to investigate the influence of menstrutation on women's physical performance to facilitate training guidance and individualization programs for female athletes. This present study aimed to investigate athletes' self-reported health concerns and sports performance during the menstrual cycle, both in training and competition, along with the willingness of the athletes to talk over pertinent to their menstrual cycles.

The complex interaction of hormones during the menstrual cycle has the potential to exert influence on several metabolic, cardiovascular, and pulmonary parameters (Yapıcı-Öksüzoğlu & Egesoy, 2021). Menstrual cycle disorders frequently experience among female athletes (Fernanda et al., 2021). This makes athletes use hormonal contraception more frequently, especially oral contraceptives, to reduce menstrual symptoms such as bloating and cramping, as well as to control the incidence of bleeding in preparing for the competition (Cheng et al., 2021). Our study shows that most athletes do not use drugs to prevent or delay menstruation, despite the fact that most feel pain during menstruation. In contrast to the data reported by Martin et al. (2018), which indicated that 68 % of athletes preferred oral contraceptive pills as their first choice of hormonal contraception, establishing this method as the most prevalent. Nevertheless, it is essential to acknowledge that the utilization of oral contraceptives may lead to a reduction in bone mineral density when compared to individuals who do not use such contraceptives, particularly among teenagers and young females (Goshtasebi et al., 2019).

Moreover, the findings of our inquiry underscore that a significant proportion of athletes encounter diverse health issues, including but not limited to lumbar discomfort, heightened susceptibility to fatigue, mood swings, cephalgia, and a wide range of health complications. However, the most dominant health problem is abdominal pain/pain in the lower abdomen. This is consistent with the findings of Randell et al. (2021), which indicate that female football players experience sport performance-impairing side effects, including nausea, headaches, and stomach pains during their menstrual cycle. Armento et al. (2021) as well consistently disclosed that menstruation experienced by athletes causes fatigue, back pain, and reduced energy (63 %), and 45 % of elite female athletes in long-distance events experience bone health problems. Furthermore, a research investigation conducted by Bruinvels et al. (2016) also revealed that more than seventy percent of elite athletes encountered detrimental side effects linked to the menstrual cycle, with adverse effects comprising twenty-four discrete symptoms that varied in duration, severity, and occurrence among the participants. Senatore et al. (2019) also reported that the menstruation exerts a substantial impact on the activities undertaken by athletes, encompassing both physical and mental dimensions.

Athletes' hormonal profiles are essential for developing accurate individual profiles that can be associated with their performance (e.g., strength and plyometric competence), injuries, and exercise response (Julian & Sargent, 2020). A significant proportion of Australian female athletes, Olympians, and/or Paralympians preparing for the Tokyo Olympics and/or Paralympics admitted that menstruation impacted their performance during exercise (sixty-five percent) and competition (fifty-eight percent) respectively (McNamara, Harris, & Minahan, 2022), particularly during the early stages of the follicular and late luteal phase (Righi & Barroso, 2022). Our present study also disclosed that most collegiate female athletes consider their menstrual cycle to exert an adverse impact both during training and competition, which causes them to tire more easily, have less endurance, and reduce their speed during physical activity. This is also supported by research conducted by Read et al. (2022) on elite female football players from two English Women's Super League (WSL) clubs, who revealed that all participants (100 %) reported perceiving a negative impact on their performance due to their menstrual cycle, and more than half of the players (53 %) reported experiencing decreased appetite and sleep quality prior to engaging in sports activities during menstruation. Meanwhile, a study conducted by Solli et al. (2020) unveiled that a significant proportion of competitive endurance athletes engaged in biathlon or cross-country skiing saw either improved (42 %) or diminished (49 %) performance during their period.

The coach is responsible not only for enhancing athlete performance by evaluating physical, mental, and strategic training but also for various physiological, health, and emotional issues in each athlete, such as the menstrual cycle, which is unavoidable for female athletes. Menstruation is frequently perceived as a biological process related to culture and social meaning and is often viewed negatively (Botello-Hermosa & Casado-Mejia, 2015). The results of our study show that more than fifty percent of respondents chose to discuss the menstrual cycle with coaches. Still, only female coaches/managers and several other athletes chose not to discuss it with their male coaches/managers because of embarrassment. They assumed that male trainers did not understand menstruation. This is consistent with what was revealed by Findlay et al. (2020) that some elite athletes are reluctant to tell their menstrual cycles to coaches or male staff on their team due to awkwardness, embarrassment, and

gender differences, as well as the athletes believe that their coaches cannot assist.

The results of the thematic analysis conducted by Martina et al. (2021) expressed that knowledge (e.g., ignorance or perceptions of inadequate knowledge levels), interpersonal (e.g., the incorrect presumption about the coach/athletes and social discomfort), and structural, e.g., differences in collective perceptions that affect coaches/athletes disproportionately) are the three primary reasons why female athletes do not disclose their menstrual cycles to coaches. Bergström et al. (2023) also conformable that the barrier between female athletes and male coaches in discussing menstruation is the incorrect assumption and prejudice that coaches do not want to be bothered with their menstrual cycle issues or cannot comprehend them. Consequently, despite having a greater understanding of these issues, coaches interpret female athletes' reticence as a lack of desire or need to discuss their menstrual issues. Kristiansen et al. (2012) explained that athletes' perceptions of coach knowledge could create a communication barrier between athletes and coaches and lead to poorly designed training programs, which is likely to significantly impact their sporting performance (de Haan & Norman, 2020).

Moreover, there was a significant difference in training frequency per week (week/day) among female collegiate student-athletes to their menstrual period, which is another noteworthy finding from our present study that should be highlighted. Our result was consistent with Ergin and Kartal (2020), who explained that Volleyball players who competed in the Turkish Volleyball Sultans' League conveyed that their menstrual cycle occasionally interferes with their participation both in training (46.2 %) and competition (99.2 %). Twenty percent of participants in the study by Adam et al. (2022) reported skipping training or competition due to unbearable pain during their menstrual cycle. Experiencing pain during the menstrual period is a physiological response to the underlying health issue, mainly due to hormonal fluctuations. Hence, athletes may not consistently be able to engage either in training or competition designed to improve their skills and talents. Concerning this, it is essential to consider educational interventions for both athletes and coaches (Brown & Knight, 2022), including management strategies for training and competition that consider the athlete's menstrual cycle (Brown, Knight, & Forrest (née Whyte), 2021; Statham, 2020).

This present study was limited to female student-athletes perspectives; future researchers are encouraged to discover more about the viewpoints of coaches and club managers regarding the health issues experienced by athletes and their performance during menstruation, including their coping strategies. Follow-up focus group discussions could also be conducted between athletes, coaches, and club managers to investigate these issues further. Additionally, information regarding coaches' along with the club managers' perceptions of menstruation must be explore further to determine whether they genuinely do not comprehend the effects of menstruation on performance due to a lack of understanding or because club managers impose a championship goal for each athlete in achievement sports training.

Conclusions

The management of coaching male and female athletes has different levels of difficulty. The menstrual cycle is one factor that contributes to female athletes' more complex coaching management than male athletes. The findings from our research emphasize that female collegiate-student athletes experience various health issues during menstruation. Our study also found a communication gap between athletes and coaches, notably the athletes' reluctance to communicate and plan their training with their coaches while considering their menstrual cycle. Hence, athletes and coaches must be informed of the physical, psychological, and emotional health difficulties that can arise during menstruation. On the other hand, building awareness among athletes and coaches concerning the menstrual cycle's impact on athletes' health, well-being, and performance is another key to success that can be incorporated into a management strategy for sports achievement development for women. Coaches can encourage communication by asking athletes about their menstrual cycles and using smartphone/smartwatch apps to monitor information about their upcoming periods. Thus, athletes and coaches can work together to discuss and adjust training programs by considering the athlete's menstrual cycle, especially in the early follicular and the follicular or proliferative phase, which causes athletes tend to experience fatigue more quickly and experience excessive pain. Additionally, medical practitioners and sports nutritionists must be involved in athlete development initiatives programs to maximize athlete performance during training and competition.

Conflict of interest

There are no conflicts of interest to report.

References

Fink, J. S. (2015). Female athletes, women's sport, and the sport media commercial complex: Have we really "come a long way, baby"? *Sport Management Review, 18*(3), 331-342. https://doi.org/10.1016/j.smr.2014.05.001

Forsyth, J., & Roberts, C.-M. (2018). *Introduction to The Exercising Female: Science and Its Application.* In The Exercising Female. Routledge.

International Olympic Committee. (2020). *Gender equality through time: At the Olympic Games.* Retrieved February 18, 2023, from https://olympics.com/ioc/gender-equality/gender-equality-through-time

Mikkelsen, K., Stojanovska, L., Polenakovic, M., Bosevski, M., & Apostolopoulos, V. (2017). Exercise and mental health. *Maturitas,* 106, 48-56. https://doi.org/10.1016/j.maturitas.2017.09.003

Lavie, C. J., Arena, R., Swift, D. L., Johannsen, N. M., Sui, X., Lee, D.-C., … Blair, S. N. (2015). Exercise and the cardiovascular system: Clinical science and cardiovascular outcomes. *Circulation Research, 117*(2), 207-219. https://doi.org/10.1161/CIRCRESAHA.117.305205

Harrison, C. L., Brown, W. J., Hayman, M., Moran, L. J., & Redman, L. M. (2016). The Role of Physical Activity in Preconception, Pregnancy and Postpartum Health. *Seminars in Reproductive Medicine, 34*(02), e28-e37. https://doi.org/10.1055/s-0036-1583530

Orio, F., Muscogiuri, G., Ascione, A., Marciano, F., Volpe, A., La Sala, G., … Palomba, S. (2013). Effects of physical exercise on the female reproductive system. *Minerva Endocrinologica, 38*(3), 305-319.

Caudwell, P., Gibbons, C., Finlayson, G., Näslund, E., & Blundell, J. (2014). Exercise and Weight Loss: No Sex

Differences in Body Weight Response to Exercise. *Exercise and Sport Sciences Reviews, 42*(3), 92-101. https://doi.org/10.1249/JES.0000000000000019

Swift, D. L., Johannsen, N. M., Lavie, C. J., Earnest, C. P., & Church, T. S. (2014). The Role of Exercise and Physical Activity in Weight Loss and Maintenance. *Progress in Cardiovascular Diseases, 56*(4), 441-447. https://doi.org/10.1016/j.pcad.2013.09.012

Holtzman, B., & Ackerman, K. E. (2021). Recommendations and Nutritional Considerations for Female Athletes: Health and Performance. *Sports Medicine, 51*(1), 43-57. https://doi.org/10.1007/s40279-021-01508-8

Lebrun, C. M., Joyce, S. M., & Constantini, N. W. (2013). *Effects of Female Reproductive Hormones on Sports Performance.* In N. Constantini & A. C. Hackney (Eds.), Endocrinology of Physical Activity and Sport: Second Edition (pp. 281-322). Totowa, NJ: Humana Press. https://doi.org/10.1007/978-1-62703-314-5_16

Mountjoy, M., Sundgot-Borgen, J., Burke, L., Carter, S., Constantini, N., Lebrun, C., … Ljungqvist, A. (2014). The IOC consensus statement: Beyond the Female Athlete Triad—Relative Energy Deficiency in Sport (RED-S). *British Journal of Sports Medicine, 48*(7), 491-497. https://doi.org/10.1136/bjsports-2014-093502

Ön, S., Diker, G., & Özkamçi, H. (2014). Effect Of Menstrual Cycle Anaerobic Power and Active Jumping Performance at Adolescent Volleyball Athletes. *E-Journal of New World Sciences Academy,* 9, 32-42. https://doi.org/10.12739/NWSA.2014.9.2.2B0099

Julian, R., & Sargent, D. (2020). Periodisation: Tailoring training based on the menstrual cycle may work in theory but can they be used in practice? *Science and Medicine in Football, 4*(4), 253-254. https://doi.org/10.1080/24733938.2020.1828615

Oosthuyse, T., & Bosch, A. N. (2010). The effect of the menstrual cycle on exercise metabolism: Implications for exercise performance in eumenorrhoeic women. *Sports Medicine (Auckland, N.Z.), 40*(3), 207-227. https://doi.org/10.2165/11317090-000000000-00000

Constantini, N. W., Dubnov, G., & Lebrun, C. M. (2005). The menstrual cycle and sport performance. *Clinics in Sports Medicine, 24*(2), e51-82, XIII-XIV. https://doi.org/10.1016/j.csm.2005.01.003

Loveless, M. B. (2017). Female athlete triad. *Current Opinion in Obstetrics and Gynecology, 29*(5), 301-305. https://doi.org/10.1097/GCO.0000000000000396

Meczekalski, B., Katulski, K., Czyzyk, A., Podfigurna-Stopa, A., & Maciejewska-Jeske, M. (2014). Functional hypothalamic amenorrhea and its influence on women's health. *Journal of Endocrinological Investigation, 37*(11), 1049-1056. https://doi.org/10.1007/s40618-014-0169-3

Findlay, R. J., Macrae, E. H. R., Whyte, I. Y., Easton, C., & Forrest Née Whyte, L. J. (2020). How the menstrual cycle and menstruation affect sporting performance: Experiences and perceptions of elite female rugby players. *British Journal of Sports Medicine, 54*(18), 1108-1113. https://doi.org/10.1136/bjsports-2019-101486

Parker, M., Sneddon, A., & Arbon, P. (2010). The menstrual disorder of teenagers (MDOT) study: Determining typical menstrual patterns and menstrual disturbance in a large population-based study of Australian teenagers. *BJOG: An International Journal of Obstetrics & Gynaecology, 117*(2), 185-192. https://doi.org/10.1111/j.1471-0528.2009.02407.x

Subasinghe, A. K., Happo, L., Jayasinghe, Y. L., Garland, S. M., Gorelik, A., & Wark, J. D. (2016). Prevalence and severity of dysmenorrhoea, and management options reported by young Australian women. *Australian Family Physician, 45*(11), 829-834.

Wodarska, M., Witkoś, J., Drosdzol-Cop, A., Dąbrowska, J., Dąbrowska-Galas, M., Hartman, M., … Skrzypulec-Plinta, V. (2013). Menstrual cycle disorders in female volleyball players. *Journal of Obstetrics and Gynaecology, 33*(5), 484-488. https://doi.org/10.3109/01443615.2013.790885

Prado Seoane, Á. (2013). Influencia del ciclo menstrual en la flexibilidad en natación sincronizada. *Agon, 3*(2), 53-59.

Ansdell, P., Brownstein, C. G., Škarabot, J., Hicks, K. M., Simoes, D. C. M., Thomas, K., … Goodall, S. (2019). Menstrual cycle-associated modulations in neuromuscular function and fatigability of the knee extensors in eumenorrheic women. *Journal of Applied Physiology, 126*(6), 1701-1712. https://doi.org/10.1152/japplphysiol.01041.2018

Bruinvels, G., Burden, R. J., McGregor, A. J., Ackerman, K. E., Dooley, M., Richards, T., & Pedlar, C. (2017). Sport, exercise and the menstrual cycle: Where is the research? *British Journal of Sports Medicine, 51*(6), 487-488. https://doi.org/10.1136/bjsports-2016-096279

Costello, J. T., Bieuzen, F., & Bleakley, C. M. (2014). Where are all the female participants in Sports and Exercise Medicine research? *European Journal of Sport Science, 14*(8), 847-851. https://doi.org/10.1080/17461391.2014.911354

Cowley, E. S., Olenick, A. A., McNulty, K. L., & Ross, E. Z. (2021). "Invisible Sportswomen": The Sex Data Gap in Sport and Exercise Science Research. *Women in Sport and Physical Activity Journal, 29*(2), 146-151. https://doi.org/10.1123/wspaj.2021-0028

Carmichael, M. A., Thomson, R. L., Moran, L. J., & Wycherley, T. P. (2021). The Impact of Menstrual Cycle Phase on Athletes' Performance: A Narrative Review. *International Journal of Environmental Research and Public Health, 18*(4), 1667. https://doi.org/10.3390/ijerph18041667

Armour, M., Parry, K. A., Steel, K., & Smith, C. A. (2020). Australian female athlete perceptions of the challenges associated with training and competing when menstrual symptoms are present. *International Journal of Sports Science & Coaching, 15*(3), 316-323. https://doi.org/10.1177/1747954120916073

Maged, A. M., Salah, E., Kamel, A. M., Hussein, A. M., Saad, H., Meshaal, H., & Kamal, W. M. (2017). Effect of oral contraceptives on balance in women: A randomized controlled trial. *Taiwanese Journal of Obstetrics & Gynecology, 56*(4), 463-466. https://doi.org/10.1016/j.tjog.2017.02.003

Romero-Moraleda, B., Coso, J. D., Gutiérrez-Hellín, J., Ruiz-Moreno, C., Grgic, J., & Lara, B. (2019). The Influence of the Menstrual Cycle on Muscle Strength and Power Performance. *Journal of Human Kinetics,* 68, 123-133. https://doi.org/10.2478/hukin-2019-0061

Kinsley, C., Bardi, M., Neigh, G. N., & Lambert, K. (2016). *Chapter 2—Chromosomal and Endocrinological Origins of Sex.* In G. N. Neigh & M. M. Mitzelfelt (Eds.), Sex Differences in Physiology (pp. 5–15). Boston: Academic Press. https://doi.org/10.1016/B978-0-12-802388-4.00002-1

Elliott-Sale, K. J., McNulty, K. L., Ansdell, P., Goodall, S., Hicks, K. M., Thomas, K., … Dolan, E. (2020). The Effects

of Oral Contraceptives on Exercise Performance in Women: A Systematic Review and Meta-analysis. *Sports Medicine (Auckland, N.Z.), 50*(10), 1785-1812. https://doi.org/10.1007/s40279-020-01317-5

Meignié, A., Duclos, M., Carling, C., Orhant, E., Provost, P., Toussaint, J.-F., & Antero, J. (2021). The Effects of Menstrual Cycle Phase on Elite Athlete Performance: A Critical and Systematic Review. *Frontiers in Physiology,* 12. https://doi.org/10.3389/fphys.2021.654585

Yapıcı-Öksüzoğlu, A., & Egesoy, H. (2021). The effect of menstrual cycle on anaerobic power and jumping performance. *Pedagogy of Physical Culture and Sports, 25*(6), 367-372. https://doi.org/10.15561/26649837.2021.0605

Fernanda, C., Gifari, N., Mulyani, E. Y., Nuzrina, R., & Ronitawati, P. (2021). Hubungan Asupan, Status Gizi, Aktivitas Fisik, Tingkat Stres dan Siklus Menstruasi Atlet Bulutangkis. *Sport and Nutrition Journal, 3*(1), 1-14. https://doi.org/10.15294/spnj.v3i1.41133

Cheng, J., Santiago, K. A., Abutalib, Z., Temme, K. E., Hulme, A., Goolsby, M. A., … Casey, E. K. (2021). Menstrual Irregularity, Hormonal Contraceptive Use, and Bone Stress Injuries in Collegiate Female Athletes in the United States. *PM & R: The Journal of Injury, Function, and Rehabilitation, 13*(11), 1207-1215. https://doi.org/10.1002/pmrj.12539

Martin, D., Sale, C., Cooper, S. B., & Elliott-Sale, K. J. (2018). Period Prevalence and Perceived Side Effects of Hormonal Contraceptive Use and the Menstrual Cycle in Elite Athletes. *International Journal of Sports Physiology and Performance, 13*(7), 926-932. https://doi.org/10.1123/ijspp.2017-0330

Goshtasebi, A., Subotic Brajic, T., Scholes, D., Beres Lederer Goldberg, T., Berenson, A., & Prior, J. C. (2019). Adolescent use of combined hormonal contraception and peak bone mineral density accrual: A meta-analysis of international prospective controlled studies. *Clinical Endocrinology, 90*(4), 517-524. https://doi.org/10.1111/cen.13932

Randell, R. K., Clifford, T., Drust, B., Moss, S. L., Unnithan, V. B., De Ste Croix, M. B. A., … Rollo, I. (2021). Physiological Characteristics of Female Soccer Players and Health and Performance Considerations: A Narrative Review. *Sports Medicine (Auckland, N.Z.), 51*(7), 1377-1399. https://doi.org/10.1007/s40279-021-01458-1

Armento, A., VanBaak, K., Seehusen, C. N., Sweeney, E. A., Wilson, J. C., & Howell, D. R. (2021). Presence and Perceptions of Menstrual Dysfunction and Associated Quality of Life Measures Among High School Female Athletes. *Journal of Athletic Training, 56*(10), 1094-1099. https://doi.org/10.4085/624-20

Bruinvels, Georgie, Burden, R., Brown, N., Richards, T., & Pedlar, C. (2016). The Prevalence and Impact of Heavy Menstrual Bleeding (Menorrhagia) in Elite and Non-Elite Athletes. *PloS One, 11*(2), e0149881. https://doi.org/10.1371/journal.pone.0149881

Senatore, B., Pisapia, F., & Domenico, F. D. (2019). Menstrual cycle disorders in rhythmic gymnastics athletes. *Journal of Physical Education and Sport, 19*(Supplement issue 5). https://doi.org/10.7752/jpes.2019.s5299

McNamara, A., Harris, R., & Minahan, C. (2022). 'That time of the month' … for the biggest event of your career! Perception of menstrual cycle on performance of Australian athletes training for the 2020 Olympic and Paralympic Games. *BMJ Open Sport & Exercise Medicine, 8*(2), e001300. https://doi.org/10.1136/bmjsem-2021-001300

Righi, I., & Barroso, R. (2022). Do Recreationally-Trained Women of Different Ages Perceive Symptoms of the Menstrual Cycle and Adjust Their Training According to Phases? *International Journal of Environmental Research and Public Health, 19*(21), 13841. https://doi.org/10.3390/ijerph192113841

Read, P., Mehta, R., Rosenbloom, C., Jobson, E., & Okholm Kryger, K. (2022). Elite female football players' perception of the impact of their menstrual cycle stages on their football performance. A semi-structured interview-based study. *Science & Medicine in Football, 6*(5), 616-625. https://doi.org/10.1080/24733938.2021.2020330

Solli, G. S., Sandbakk, S. B., Noordhof, D. A., Ihalainen, J. K., & Sandbakk, Ø. (2020). Changes in Self-Reported Physical Fitness, Performance, and Side Effects Across the Phases of the Menstrual Cycle Among Competitive Endurance Athletes. *International Journal of Sports Physiology and Performance,* 1-10. https://doi.org/10.1123/ijspp.2019-0616

Botello-Hermosa, A., & Casado-Mejia, R. (2015). Fears and concerns related to menstruation: A qualitative study from the perspective of gender. *Texto & Contexto - Enfermagem,* 24, 13-21. https://doi.org/10.1590/0104-07072015000260014

Martina, D., Lin, C.-P., Kristanti, M. S., Bramer, W. M., Mori, M., Korfage, I. J., Van Der Heide, A., Van Der Rijt, C. C. D., & Rietjens, J. A. C. (2021). Advance Care Planning in Asia: A Systematic Narrative Review of Healthcare Professionals' Knowledge, Attitude, and Experience. *Journal of the American Medical Directors Association, 22*(2), 349.e1-349.e28. https://doi.org/10.1016/j.jamda.2020.12.018

Bergström, M., Rosvold, M., & Sæther, S. A. (2023). "I hardly have a problem […] I have my period quite rarely too": Female football players' and their coaches' perceptions of barriers to communication on menstrual cycle. *Frontiers in Sports and Active Living,* 5. https://doi.org/10.3389/fspor.2023.1127207

Kristiansen, E., Tomten, S. E., Hanstad, D. V., & Roberts, G. C. (2012). Coaching communication issues with elite female athletes: Two Norwegian case studies. *Scandinavian Journal of Medicine & Science in Sports, 22*(6), e156-167. https://doi.org/10.1111/j.1600-0838.2012.01521.x

de Haan, D., & Norman, L. (2020). Mind the gap: The presence of capital and power in the female athlete–male -coach relationship within elite rowing. *Sports Coaching Review, 9*(1), 95-118. https://doi.org/10.1080/21640629.2019.1567160

Ergin, E., & Kartal, A. (2020). Menstrual Cycle and Sporting Performance Perceptions of Elite Volleyball Players. *International Journal of Applied Exercise Physiology, 9*(10), 57-64. https://doi.org/10.26655/IJAEP.2020.10.1

Adam, M. E. K., Bristow, A., Neely, K. C., & Erlandson, M. C. (2022). Do women athletes' experiences of menstrual function and dysfunction vary across competition levels? A mixed methods exploration. *Psychology of Sport and Exercise,* 63, 102270. https://doi.org/10.1016/j.psychsport.2022.102270

Brown, N., & Knight, C. J. (2022). Understanding female coaches' and practitioners' experience and support provision in relation to the menstrual cycle. *International Journal of Sports Science & Coaching, 17*(2), 235-243. https://doi.org/10.1177/17479541211058579

Brown, N., Knight, C. J., & Forrest (née Whyte), L. J. (2021). Elite female athletes' experiences and perceptions of the menstrual cycle on training and sport performance. *Scandinavian Journal of Medicine & Science in Sports, 31*(1), 52-69. https://doi.org/10.1111/sms.13818

Statham, G. (2020). *Understanding the effects of the menstrual cycle on training and performance in elite athletes: A preliminary study.* In B. L. Parkin (Ed.), Progress in Brain Research (pp. 25-58). Elsevier. https://doi.org/10.1016/bs.pbr.2020.05.028

Визначення впливу менструального циклу на студенток-спортсменок: Самооцінка проблем, пов'язаних із станом здоров'я, спортивними показниками та готовністю обговорювати питання щодо менструації

Єтті Септьяні Мустар[1ABCDE], Баю Агун Прамоно[1BCD], Феббі Алфу Хойрун Нісса[1BCD], Індра Хімаван Сусанто[1ABDE], Анна Нурдія[1ABDE], Діта Юліастрід[1ABDE]

[1]Сурабайський державний університет

Авторський вклад: A – дизайн дослідження; B – збір даних; C – статаналіз; D – підготовка рукопису; E – збір коштів

Реферат. Стаття: 10 с., 4 табл., 1 рис., 57 джерел.

Історія питання. Комплексне розуміння менструального циклу, пов'язаних з цим фізіологічним процесом проблем зі здоров'ям і подальшого впливу на спортивну результативність сприятимуть формулюванню обґрунтованих та індивідуальних стратегій тренувань і участі у змагальних видах спорту. У свою чергу, такі знання можуть зменшити ймовірність виникнення травм, підтримати психологічне благополуччя і, зрештою, підвищити продуктивність спортсменок.

Мета дослідження. Метою дослідження було вивчити ставлення студенток-спортсменок до проблем, пов'язаних із станом здоров'я та спортивних результатів під час менструального циклу, як з точки зору тренувань, так і змагань, а також готовність спортсменок обговорювати питання, що стосуються їхнього менструального циклу.

Матеріали та методи. У нашому дослідженні взяли участь 115 студенток-спортсменок, які займаються індивідуальними/командними видами спорту на суші (n = 95) та комбінованими видами спорту на суші/воді (n = 20). З метою збору даних для цього перехресного дослідження було використано опитувальник, який заповнювали самі учасниці. Було проведено описовий аналіз, результати якого представлено у вигляді частоти та відсотків, після чого було застосовано критерій рангових сум Вілкоксона (критерій Манна-Уітні) для аналізу середніх відмінностей між групами учасниць тренувань під час менструації.

Результати. Загалом, усі спортсменки стикалися з кількома проблемами зі здоров'ям, найпоширенішими з яких були біль у животі та нижній частині спини. Крім того, майже всі учасниці дослідження (95,33%) відчували біль у перший день менструального циклу. Менструація також впливає на показники результативності спортсменок під час фізичних вправ (70,43%) та змагань (73,91%), викликаючи у більшості з них підвищену втомлюваність та зниження рівня витривалості. Також спостерігається суттєва різниця між контекстом тренувального процесу та кількістю сеансів щотижневих фізичних вправ (0,011) під час менструального циклу.

Висновки. Менструація суттєво впливає на стан здоров'я та продуктивність спортсменок як під час тренувань, так і під час спортивних змагань. Вкрай важливо, щоб тренери та спортсменки мали комплексне розуміння механізму менструального циклу з метою ефективного розв'язання цієї проблеми. Крім того, залучення медичних працівників та спортивних дієтологів до процесу регулювання менструального циклу є ще однією стратегією щодо підвищення результативності спортсменок.

Ключові слова: період, проблеми зі здоров'ям, фолікулярна фаза, спортсменки, фізичні вправи, змагання.

Information about the authors:

Mustar, Yetty Septiani: yettymustar@unesa.ac.id; https://orcid.org/0000-0003-0079-3795; Department of Health Education and Recreation, Universitas Negeri Surabaya, Jl. Lidah Wetan, Lidah Wetan, Kec. Lakarsantri, Kota SBY, Jawa Timur 60213, Indonesia.

Pramono, Bayu Agung: bayupramono@unesa.ac.id; https://orcid.org/0000-0002-9308-1289; Department of Sport Coaching Education, Universitas Negeri Surabaya, Jl. Lidah Wetan, Lidah Wetan, Kec. Lakarsantri, Kota SBY, Jawa Timur 60213, Indonesia.

Nissa, Febby Alfu Khoirun: febbyalfu@gmail.com; https://orcid.org/0000-0002-3777-2587; Department of Health Education and Recreation, Universitas Negeri Surabaya, Jl. Lidah Wetan, Lidah Wetan, Kec. Lakarsantri, Kota SBY, Jawa Timur 60213, Indonesia.

Susanto, Indra Himawan: indrasusanto@unesa.ac.id; https://orcid.org/0000-0001-6132-9051; Department of Health Education and Recreation, Universitas Negeri Surabaya, Jl. Lidah Wetan, Lidah Wetan, Kec. Lakarsantri, Kota SBY, Jawa Timur 60213, Indonesia.

Noordia, Anna: annanoordia@unesa.ac.id; https://orcid.org/0000-0002-8749-4300; Department of Health Education and Recreation, Universitas Negeri Surabaya, Jl. Lidah Wetan, Lidah Wetan, Kec. Lakarsantri, Kota SBY, Jawa Timur 60213, Indonesia.

Yuliastrid, Dita: ditayuliastrid@unesa.ac.id; https://orcid.org/0000-0003-2956-9340; Department of Health Education and Recreation, Universitas Negeri Surabaya, Jl. Lidah Wetan, Lidah Wetan, Kec. Lakarsantri, Kota SBY, Jawa Timur 60213, Indonesia.

Cite this article as: Mustar, Y. S., Pramono, B. A., Nissa, F. A. K., Susanto, I. H., Noordia, A., & Dita Yuliastrid, D. (2024). Determining the Impact of Menstrual Cycle on Collegiate Athletes: Self-reported Health Issues, Sports Performance, and Willingness to Discuss Regarding Menstruation. *Physical Education Theory and Methodology, 24*(4), 529-538. https://doi.org/10.17309/tmfv.2024.4.03

Received: 21.06.2024. Accepted: 10.07.2024. Published: 30.08.2024