Issue Rehabil. Orthop. Neurophysiol. Sport Promot. 2023; 43: 31–41. ISSN 2300-0767
DOI: 10.19271/IRONS-000188-2023-43

ORIGINAL ARTICLE

THE IMPORTANCE OF THE MENSTRUAL CYCLE IN WOMEN'S SPORT – VOLLEYBALL PLAYERS' OPINION

ZNACZENIE CYKLU MENSTRUACYJNEGO W SPORCIE KOBIET – W OPINII ZAWODNICZEK PIŁKI SIATKOWEJ

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ABSTRACT

Introduction

In the sport of volleyball, the physical and mental preparation of players is crucial for optimal performance. However, since most of the research on the sport is conducted on men, there is a lack of knowledge regarding women-specific demands in the sport, and the impact of the menstrual cycle is often underestimated. While some research on this topic has been conducted by Turkish and British study groups, there remains a scarcity of studies worldwide, including in Poland, that address the ailments associated with the menstrual cycle.

Aim

The aim of this study was to analyze the influence of menstrual cycle ailments on performance efficiency and participation in training and competitions among female players registered in the Polish Volleyball Association (PZPS).

Material and methods

Female players registered in the PZPS, including those from the Tauron League, the First Women's League, and the Second Women's League, were invited to complete an online questionnaire. The questionnaire consisted of five sections that gathered information on players' characteristics, including age, level of competition, training data, menstrual cycle data, and related ailments.

Results

A total of 158 players participated in the study. The results revealed that the majority of female athletes (94%) experience ailments related to the menstrual cycle, which also impact their performance efficiency. The impact is primarily negative for 62% of participants, but 16% also reported a positive impact. Around 80% of the players stated that physical activity has a positive or neutral effect on their well-being. Despite the negative ailments and the negative impact on performance efficiency, all players reported always participating in training and competitions. The only difference observed was that more players participated in competitions (87 players) compared to training (81 players).

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Authors reported no source of funding
Authors declared no conflict of interest

Date received: 12th May 2023
Date accepted: 06th June 2023

Conclusions
The study findings indicate that despite the frequent occurrence of ailments related to the menstrual cycle, female volleyball players do not refrain from engaging in physical activity. Furthermore, the varying impact on performance efficiency typically does not deter their participation in training and competitions. However, due to the diverse experiences of menstrual cycle ailments, support and understanding from coaches are crucial for the athletes' journey toward success in sports. Including considerations of the menstrual cycle in training preparation is an essential aspect of optimizing players' performance.

Keywords: women's volleyball, menstrual cycle, ailments, performance efficiency

STRESZCZENIE
Wprowadzenie
W sporcie, jakim jest siatkówka, przygotowanie fizyczne i psychiczne zawodniczek i zawodników jest kluczowe dla osiągnięcia optymalnych wyników. Ponieważ, większość badań dotyczących tego sportu przeprowadzana jest na mężczyznach, brakuje jednak wiedzy na temat specyficznych wymagań kobiet w tym sporcie, a wpływ cyklu menstruacyjnego jest często niedoceniany. Chociaż niektóre badania na ten temat zostały przeprowadzone przez tureckie i brytyjskie grupy badawcze, na całym świecie, w tym w Polsce, nadal brakuje opracowań naukowych dotyczących dolegliwości związanych z cyklem menstruacyjnym.

Cel
Celem pracy była analiza wpływu dolegliwości związanych z cyklem miesiączkowym na wydolność oraz udział w treningach i zawodach wśród zawodniczek zarejestrowanych w Polskim Związku Piłki Siatkowej (PZPS).

Materiał i metody
Zawodniczki zarejestrowane w PZPS, w tym zawodniczki z Tauron Ligi, Pierwszej Ligi Kobiet i Drugiej Ligi Kobiet, zostały poproszone o wypełnienie kwestionariusza internetowego. Kwestionariusz składał się z pięciu części, w których zbierano informacje na temat cech charakterystycznych zawodniczek, w tym wieku, poziomu rywalizacji, danych dotyczących treningu, cyklu menstruacyjnego i związanych z nim dolegliwości.

Wyniki
W badaniu wzięło udział 158 zawodniczek. Wyniki wykazały, że większość zawodniczek (94%) doświadcza dolegliwości związanych z cyklem menstruacyjnym, które mają wpływ na ich wydajność. W przypadku 62% uczestniczek wpływ ten jest przede wszystkim negatywny, ale 16% zgłosiło również wpływ pozytywny. Około 80% zawodniczek stwierdziło, że aktywność fizyczna ma pozytywny lub neutralny wpływ na ich samopoczucie. Pomimo negatywnych dolegliwości i negatywnego wpływu na wydajność, wszystkie zawodniczki zgłosiły, że zawsze uczestniczą w treningach i zawodach. Jedyną zaobserwowaną różnicą był fakt, że więcej zawodniczek brało udział w zawodach (87 siatkarek) niż w treningu (81 siatkarek).

Wnioski
Wyniki badania wskazują, że pomimo częstego występowania dolegliwości związanych z cyklem menstruacyjnym, siatkarki nie powstrzymują się od aktywności fizycznej. Co więcej, różny wpływ tych dolegliwości na efektywność gry zazwyczaj nie zniechęca je do udziału w treningach i zawodach. Jednak ze względu na różnorodne doświadczenia związane z dolegliwościami związanymi

z cyklem menstruacyjnym, wsparcie i zrozumienie ze strony trenerów są kluczowe w drodze do sukcesu sportowego zawodniczek. Uwzględnienie kwestii cyklu menstruacyjnego w przygotowaniach do treningu może być istotnym aspektem optymalizacji wyników zawodniczek.

Słowa kluczowe: piłka siatkowa kobiet, cykl menstruacyjny, dolegliwości, wydolność

Introduction

Volleyball is a popular team sport (Reeser & Bahr, 2017) that requires careful physical and mental preparation to achieve optimal results in national and international competitions. Training plans are designed to address various aspects of player performance. However, the impact of the menstrual cycle on female athletes in volleyball is an important consideration that is often overlooked. During menstruation, approximately 75% of female athletes experience negative effects such as cramps, back pain, headaches, and bloating. These symptoms can significantly impact performance (Martin *et al.,* 2018). The menstrual cycle involves hormonal fluctuations that can affect multiple aspects of the body, including strength, metabolism, inflammation, body temperature, fluid balance, and injury risk (Oosthuyse and Bosch, 2010). While the menstrual cycle can influence performance, the extent of its impact is highly individualized. Some research suggests no cycle-related differences in performance (Colenso-Semple *et al.,* 2023). However, studies have also indicated that certain menstrual cycle phases may be more favorable for high-intensity workouts. For example, the follicular phase has been associated with higher pain tolerance & perceived energy levels, making it potentially optimal for intense training (Sung *et al.,* 2014). The ovulation phase may provide an opportunity for female athletes to achieve personal bests in strength, but it also carries an increased risk of ACL injury (Lefevre *et al.,* 2013). Conversely, the luteal phase of the menstrual cycle may present challenges for high-intensity workouts, as the body may not be adequately prepared. Premenstrual syndrome can also impact training and performance during this phase. However, recent studies have suggested that these factors may not necessarily impair performance (Notley *et al.,* 2019). In addition to the physical aspects, the menstrual cycle can significantly affect the mental well-being of female volleyball players. This aspect should not be overlooked, as it can have implications for overall performance and player satisfaction (Constantini, Dubnov & Lebrun, 2005).

The menstrual cycle and its impact on female athletes in sports have been largely overlooked and understudied compared to research regarding different aspects of male athletes (Costello, Bieuzen & Bleakley, 2014). Despite its relevance, the significance of the menstrual cycle in women's sports remains largely unexplored (Bruinvels *et al.,* 2017). Consequently, there is a need to increase knowledge and awareness of the menstrual cycle among players and coaches (Chrisler, 2013; de Haan & Sotiriadou, 2019). Understanding the menstrual cycle's implications would contribute to tailoring training plans to individual players and teams.

Previous studies have examined the menstrual cycle's effect on Turkish volleyball players' performance, revealing that over 45% of players reported that menstruation sometimes impacts their athletic performance (Ergin & Kartal, 2020). In Poland, research on menstrual problems has primarily focused on teenage volleyball players (Wodarska *et al.*, 2013). This study found that the regularity of menstrual cycles in female youth volleyball players (aged 13–17) is influenced by the number of volleyball training hours per week. Irregular cycles or the absence of menstruation may be associated with the duration of training per week or years of training.

Therefore, the present study aims to investigate the impact of the menstrual cycle and associated ailments on the performance efficiency of elite female volleyball players and their participation in training and competitions. The study seeks to determine whether these ailments are perceived as positive, negative, or irrelevant factors. The null hypothesis (H0) posits that menstrual cycle ailments do not significantly affect the performance efficiency of female athletes and do not influence their training and participation in competitions.

Material and methods

Study Design

This study was conducted as an observational cross-sectional study, utilizing an online questionnaire developed based on previous research among female volleyball players.

Participants and Data Collection

Players registered in the Polish Volleyball Association (PZPS) (from the Tauron League, the First Women's League, and the Second Women's League) were invited to participate in the study using an online questionnaire. An official invitation was sent via email by the research team leader to all clubs in the mentioned leagues. In cases where there was no response to the email, the research team reached out to the clubs' authorities through social media platforms like Facebook or other means such as phone contact. Upon confirmation of a team's willingness to participate, a direct link to the online questionnaire was provided to be shared with the players. The inclusion criteria for female volleyball players in this study were completing the questionnaire and being a registered player in the aforementioned leagues. The exclusion criterion was the absence of menstruation or amenorrhea. All participants were informed about the study's purpose and participated voluntarily. According to current regulations, no additional bioethical approval was required for this study since the participants completed an online form.

Questionnaire

For the study, an online questionnaire was created, consisting of 44 questions divided into 10 sections, and it took about 10 minutes to complete. The questionnaire includes sections as follows as age, level of play, information regarding the participation in the national team, training data, menstruation section (to determine whether a player menstruates and what syndromes she experiences), information on potential usage of contraception, detailed section on menstruation and players self-feeling and symptoms occurring before, during and after menstruation, the section regarding menstruation and physical activity, the section on coach awareness of what phase of the menstrual cycle athlete is in, the section on player's opinion whether the coach should have an awareness related to the phasing of the menstrual cycle. In the last section, due to the need to select questions and limit the questionnaire's scope, the players could share their views with the research team members and express their opinion on any menstrual cycle-related issue. They were also allowed to contact the research team members via the e-mail addresses provided. The questionnaire was constructed based on previous studies analyzing the effect of the menstrual cycle on players' performance (Ozbar *et al.,* 2016) and studies regarding elite female athletes (Brow *et al.,* 2020) and volleyball players (Ergin & Kartal, 2020) perception on the menstrual cycle. Additionally, some questions were created to explore the topic in-depth, drawing from previous research analyzing menstrual disorders (Witoś & Wróbel, 2019; Di Cagno *et al.,* 2012).

Statistics

Values were presented as percentages and absolute numbers. Kołmogorov-Smirnov test was used to verify whether the distributions of analyzed parameters differed from the normal distribution. The analysis was conducted only for players who confirmed that they felt pain during the menstrual cycle. In the further analysis the group was divided into

two subgroups: participants who experience the ailments regularly (group "regularly") and those to experience it sometimes (group "sometimes").

Additionally, the players who declared feeling ailments related to the menstrual cycle (such as feeling pain) were asked whether they affected their performance efficiency. Results were then presented regarding classification into "positive impact," group "negative impact," and "no impact" subgroups. The $\chi 2$ test was performed to verify the impact of symptoms related to the menstrual cycle on performance efficiency. Since there were six possibilities (2×3) the Bonferroni correction for multiple tests was applied. Thus, to be significant at the $P < 0.05$ level, the P value had to be less than 0.008.

An analysis of how physical activity affects the symptoms associated with the menstrual cycle was also performed. Options to choose from the questionnaire included answers such as "positive impact," "negative impact," and "no impact."

Subsequently, there was an analysis conducted of the association between the impact of ailments related to the menstrual cycle on performance efficiency (group "negative impact," group "positive impact," and "no impact") and the participation of affected players in training and competitions was conducted. There were nine possibilities in both scenarios (participation in training and participation in competitions) (table 3×3). Therefore, the results were adjusted for multiple comparisons, applying the Bonferroni correction for multiple tests. The P value had to be less than 0.005 to be significant at a $P < 0.05$ level. Statistica 13.3 PL software was used in the statistical analysis.

Results

Participants characteristics

The data was collected from September to November 2022. All 66 clubs registered in the Polish Volleyball Association (PZPS) were invited, twelve from the Tauron League, fourteen from the First Women's League, and forty from the Second Women's League. After the first e-mail contact, only three clubs expressed their willingness to participate, so we continued contact via Facebook and phone. As a result, 28 teams agreed to participate in the study. After the second phone contact, one more team decided to join the study. Five clubs refused to participate. The teams that expressed their willingness to participate are three from the Tauron League, five from the First League of Women, and twenty-four from the Second League of Women, 32 teams in total.

One hundred fifty-eight players completed the questionnaire. Based on the exclusion criteria, no participant was excluded from the study. The age range of the participants was 16–39 years old. Players who participated in the study attended the Tauron Liga (the highest level of competition), the First and Second women's volleyball league. The participants started to play in different age categories (e.g., mini volleyball, youths, cadets, juniors, and seniors). The player also declared various training days per week and the age at which the players had started menstruating (Table 1).

Significance of ailments associated with the menstrual cycle

Among the 158 female athletes who participated in the study, a majority of them (n = 148) reported experiencing symptoms related to their menstrual cycle. However, 10 participants stated that they had no menstrual cycle-related ailments and were not included in the further analysis.

As described in the statistical section, the subsequent analysis focused on two distinct groups: the "regularly group," consisting of participants who reported experiencing menstrual cycle-related ailments consistently, and the "sometimes group," comprising individuals who experienced such problems only occasionally as a result of their menstrual cycle.

Contrary to our initial hypothesis, the analysis using the $\chi 2$ test revealed a significant

Table 1. Participants' characteristics.

Feature	Outcomes	n	Cumulative number	Percentage	Cumulative percentage
Age. yRS	16–39	158	158	100	100
Level of competitions	Tauron Liga	11	11	7	7
	1st women's league	20	31	12.6	19.6
	2nd women's league	127	158	80.4	100
Starting age of playing	Mini volleyball (7–12 years)	107	107	67.7	67.7
	Youths (13–14 years)	33	140	20.9	88.6
	Cadets (15–16 years)	12	152	7.6	96.2
	Juniors (17–18 years)	4	156	2.5	98.7
	Seniors	2	158	1.3	100
Training days a week	2 days and less	4	4	2.5	2.5
	3–4 days	36	40	22.8	25.3
	5–6 days	110	150	69.6	94.9
	7 days	8	158	5.1	100
First menstruation	10 years or less	5	5	3.2	3.2
	11 years	32	37	20.3	23.5
	12 years	47	84	29.7	53.2
	13 years	37	121	23.4	76.6
	14 years	30	151	19	95.6
	15 years or more	7	158	4.4	100

association between menstrual cycle ailments and athletes' performance efficiency ($\chi 2$ = 11.54, df = 2, p = 0.003). The observed P value remained significant even after applying the Bonferroni correction (p < 0.008), indicating that hypothesis H0 could not be accepted. Specifically, a negative impact of menstrual cycle ailments on the performance efficiency of athletes was noted (Figure 1).

Furthermore, we investigated the influence of physical activity on menstrual cycle-related symptoms. The analysis showed that for more than 38% of the participants (n = 57) who engaged in physical activity, it positively affected their well-being. Approximately 42% (n = 62) experienced no significant effect, while less than 20% reported a negative impact.

We then examined the association between the impact of menstrual cycle ailments on performance efficiency (group "negative impact," group "positive impact," and "no impact") and the athletes' participation in training and competitions. All participants (n = 148) confirmed their involvement in both training and competitions. However, when divided into groups based on the frequency of participation ("I always participate," "I often participate," and "I participate occasionally"), no significant association was found for either training ($\chi 2$ = 2.88, df = 4, p = 0.6) (Figure 2) or competitions ($\chi 2$ = 2.68, df = 4, p = 0.6) (Figure 3). The obtained P values did not exceed the predetermined significance level, indicating no association between these factors.

Discussion

The study aimed to check whether there is any association between menstrual cycle ailments and the performance efficiency of elite female volleyball players and their participation in training and competitions. The analysis revealed that although menstrual cycle-related symptoms significantly impact the overall performance efficiency of players (Figure 1), this factor does not play a crucial role in determining their participation in training (Figure 2) and competitions (Figure 3).

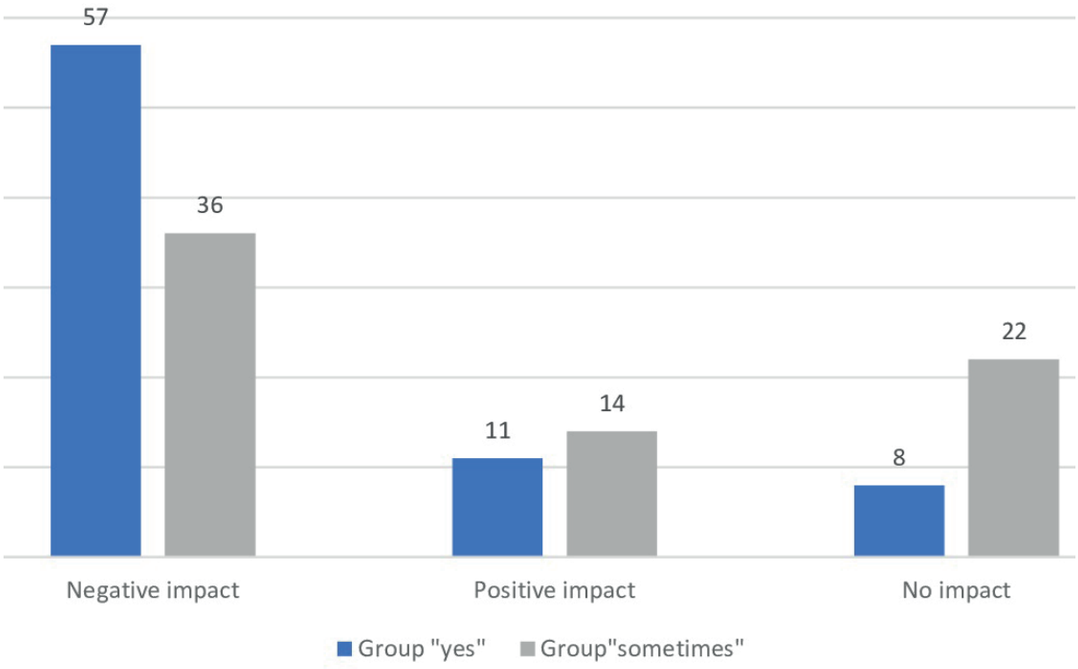

Figure 1. Association between occurrence of ailments related to the menstrual cycle and impact on efficiency

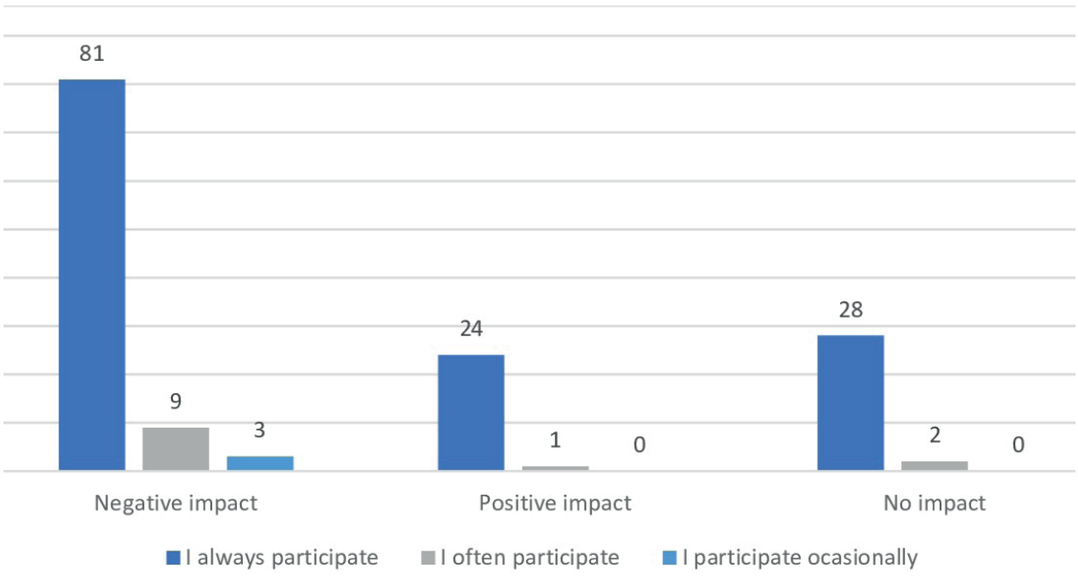

Figure 2. Association between impact of ailments related to the menstrual cycle on performance efficiency and participation in training

Among the participants, more than 93% (n = 148) reported experiencing such symptoms. This high occurrence aligns with findings from other studies where the prevalence of these symptoms is also notable, reaching 84.6% (Ergin & Kartal, 2020). However, it is worth noting that the frequency and severity of these symptoms can vary significantly among individuals. Additionally, studies have indicated that younger players report fewer and less severe complaints than older athletes (Kishali *et al.*, 2006; Wodarska *et al.*, 2013). These symptoms can be categorized into physical manifestations (e.g., headaches,

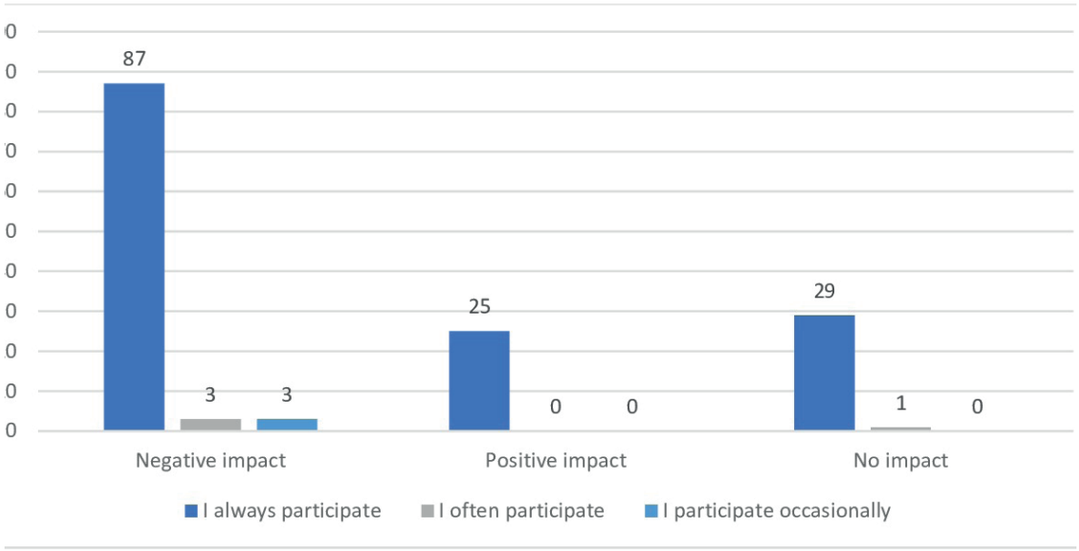

Figure 3. Association between impact of ailments related to the menstrual cycle on performance efficiency and participation in competitions

abdominal pain, cramps) and emotional manifestations (e.g., anger, irritability, mood swings).

Our initial hypothesis that ailments related to the menstrual cycle do not affect the performance efficiency of athletes was not supported by the findings of this study. Over 78% of players (n = 118) reported that it affected them, and over 62% (n = 93) of players declared a negative impact and over 16% (n = 25) positive impact (Figure 1). These results are consistent with other research in the field, where a significant number of female athletes have reported a negative impact of menstrual cycle-related symptoms (Bruinvels *et al.*, 2017; Brown, Knight, & Forrest, 2020; Ergin & Kartal, 2020). However, it is worth noting that there are also athletes who perceive a positive impact (Ergin & Kartal, 2020). It is important to acknowledge that different studies have reported diverse findings on this topic. For example, Ozbar *et al.* observed that over 91% of participants believed the menstrual cycle positively affects their performance efficiency (Ozbar *et al.*, 2016). These discrepancies highlight the individual nature of the menstrual cycle and its impact on each woman's body.

Given that the participants in this study were athletes, it was important to investigate the impact of physical activity on menstrual cycle-related ailments. Over 38% (n = 57) consider this impact positive, and almost 42% (n = 62) do not notice it. This shows that the negative impact is less common, as only less than 20% (n = 29) of the contestants experience it in connection with practicing physical activity. These findings are consistent with previous research suggesting that regular physical activity does not exacerbate menstrual cycle-related symptoms and may even contribute to improved well-being during this time (Mahvash *et al.*, 2012). However, it is important to note that the impact of exercise on the menstrual cycle itself is still a subject of debate. Some studies, such as the one conducted by Çolakoğlu & Can (2005), suggest that exercise does not affect the menstrual cycle. It is worth mentioning that the intensity of activity and training periods may influence the condition and well-being of athletes (Constantini, Dubnov, & Lebrun, 2005; Kishali *et al.*, 2006). Nevertheless, further long-term research involving a larger sample size is needed to provide more conclusive evidence in these situations.

Another aspect examined in the study is the participation of female players in training and competitions despite experiencing

symptoms related to the menstrual cycle. Notably, a significant number of players (n = 81 and n = 87) did not refrain from participating despite experiencing these symptoms. The percentage of participants in training (54.7%) is slightly lower than that of participants in competitions (58.7%). The fact that athletes continue to participate in competitions despite menstrual cycle-related symptoms is consistent with findings from other studies. For instance, in the study conducted by Ozbar *et al.,* the participation rate was as high as 97.52% (Ozbar *et al.,* 2016), and in the study by Kishali *et al.,* it was 96.3% (Kishali *et al.,* 2006). These findings suggest that female athletes are determined and committed to participating in competitive events even when experiencing menstrual cycle-related ailments.

It is essential to highlight that a considerable percentage of players (62%) reported a negative impact of menstrual cycle ailments on their performance efficiency. Despite facing these difficulties, they continue to engage in training and competitions. However, it is crucial not to overlook the athletes who experience a negative impact of physical activity on menstrual cycle-related symptoms (n = 29, 20%). The well-being and availability of players can vary significantly on any given day, making it advisable to emphasize effective communication between coaches and teams and raise awareness about issues related to the menstrual cycle (Chrisler, 2013; de Haan & Sotiriadou, 2019; Brown, Knight & Forrest, 2020). Unfortunately, it is still evident that this topic is often underestimated. Quoting responses from our survey: "Coaches and trainers should not downplay the discomfort. They often suggest that we should get used to menstruation and not make a big deal out of it" and "From an early age, I've heard that being an athlete is a full-time job. However, I often feel that admitting to feeling physically unwell during menstruation is seen as a sign of weakness, and symptoms like irritability, anger, or crying are disregarded or considered excuses. In such moments, I can't help but feel like I'm battling with myself and my body and the whole world, including the team, from which I would expect support." These quotes highlight the need for greater awareness and understanding of menstrual cycle-related issues among coaching staff and players.

Certainly, the dissemination of knowledge about the menstrual cycle and its impact on athletes' well-being can bring about positive changes in the organization and training plans of sports clubs. By raising awareness and including these issues in the overall training approach, clubs can support their female athletes in managing menstrual cycle-related symptoms and optimizing their performance. It is our hope that our study, in addition to achieving its primary objectives of examining the occurrence of menstrual cycle ailments and their impact on performance efficiency and participation, will also stimulate further reflection and exploration of this topic. By fostering a better understanding of the menstrual cycle among clubs and coaches, we anticipate improvements in the content and approach of sports programs, ultimately benefiting the overall development and well-being of female athletes.

Limitations

This study has some limitations that impact the generalizability and validity of the findings. Conducting the study through an online questionnaire posed limitations regarding the ability to verify the identity of respondents and the accuracy of their responses. It was impossible to confirm if the questionnaire was completed truthfully or if the participants truly belonged to the intended population. The initial difficulty in contacting volleyball clubs via email and relying on social media platforms for further communication also introduced limitations. There was uncertainty regarding the reasons for low response rates, such as clubs' lack of willingness to participate, incorrect contact information, or other factors.

Furthermore, using social media platforms could result in reaching individuals who were

not directly involved in the coaching and playing aspects of the clubs. Consequently, the sample obtained may not fully represent all female volleyball players in Poland. Additionally, the study's cross-sectional design limits the ability to establish causal relationships between variables. To obtain more comprehensive and reliable data, a prospective study design conducted over a more extended period would be beneficial. This would allow for data collection at multiple time points, providing a more robust understanding of the relationship between menstrual cycle ailments, performance efficiency, and participation in training and competitions. Acknowledging these limitations helps to contextualize the study's findings and highlights areas for improvement in future research endeavors.

Conclusion

The findings of our study suggest that while menstrual cycle-related symptoms have a negative impact on the overall performance efficiency of players, it does not significantly determine their participation in training and competitions. The female athletes in your study demonstrated their commitment to physical activity and did not give up exercising despite experiencing symptoms related to the menstrual cycle. However, it is important to note that these symptoms may affect their participation in certain training sessions or competitions. Recognizing and accepting that the menstrual cycle and its associated ailments are a natural part of female physiology is essential. Each individual may experience these symptoms differently, and their impact on performance can vary. By normalizing discussions around this topic and providing education, we can contribute to a more inclusive and supportive sporting environment that values the unique experiences of female athletes.

Acknowledgments

The authors would like to acknowledge all the volleyball players, coaches and clubs who took part in the study and the people who always supported them during the writing and for their cooperation in creating the questionnaire, especially Daria Zawadzka, Katarzyna Szymańska, and Mariola Wojtowicz.

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