The psychological impact of the menstrual cycle on athletic performance

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Abstract

This study investigates the psychological impact of the menstrual cycle (MC) on athletic performance among 50 professional, national, and regional-level female athletes in France, representing nine sports disciplines; rugby, football, track and field, volleyball, basketball, fencing, triathlon, swim-run, and water polo. Participants completed a 30-item questionnaire assessing the perceived influence of their MC on training and competition, followed by semi-structured interviews with a subset of participants to delve deeper into their experiences.

The study focused on four thematic areas: medical approach and menstrual tracking, relationship with coaches, perception of MC impact on performance, and the extent of its influence on outcomes. Findings reveal that MC-related psychological fluctuations—manifesting as shifts in motivation, focus, effort thresholds, and levels of stress and anxiety—significantly impact performance perception. However, menstrual tracking and its integration into training regimens remain inconsistent.

The study highlights the need for sports organizations and coaches to address the MC's psychological effects in athlete care, promoting tailored training strategies to enhance well-being and performance. Future research should integrate hormonal and psychological assessments to clarify correlations between MC phases and performance and explore effective interventions for managing the MC's impact in sports contexts.

Keywords: menstrual cycle, psychological impact, athletic performance, female athletes, women's sport, gender equality

Academic Review

The Impact of the Menstrual Cycle on Athletic Performance: Psychological Considerations

Introduction

The relationship between the menstrual cycle and athletic performance has been a topic of interest for researchers, particularly in understanding the psychological impact of hormonal fluctuations. Women's athletic performance may be influenced by changes in mood, motivation, fatigue, and cognitive function across the different phases of the menstrual cycle. This summary reviews existing literature on the psychological aspects of the menstrual cycle's impact on athletic performance, focusing on individual variability, perceived performance, methodological considerations, and practical implications.

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1. Psychological Impact of the Menstrual Cycle on Athletic Performance

The menstrual cycle can impact various psychological factors such as mood, motivation, mental fatigue, and stress perception, all of which can, in turn, affect athletic performance. Research has shown that hormonal fluctuations, particularly in the luteal phase (post-ovulation), may contribute to symptoms of premenstrual syndrome (PMS) and premenstrual dysphoric disorder (PMDD), both of which can influence mood and motivation negatively. Women often report feeling more fatigued, anxious, or irritable during this phase (Strine et al., 2005). Conversely, the follicular phase, characterized by rising oestrogen levels, is typically associated with higher energy levels, improved mood, and better cognitive focus (Reed et al., 2008)

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2. Individual Variability in Psychological Response

One of the most significant findings across studies is the variability in psychological response to the menstrual cycle. While some women experience considerable mood disturbances or reduced motivation during the luteal phase, others report minimal or no impact on their psychological state. This individual variability is influenced by factors such as baseline mental health, genetics, lifestyle, and the presence of menstrual disorders like dysmenorrhea or PMDD. For instance, studies by Witkoś & Hartman-Petrycka, (2021) and (Sanchez et al., 2023) suggest that athletes with a history of PMS or PMDD may experience more pronounced psychological symptoms, including irritability and anxiety, which could detract from athletic performance.

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3. Perceived Performance and Psychological Factors

Perceived performance refers to how athletes assess their own abilities and success during physical tasks. Psychological factors such as self-efficacy, motivation, and perceived exertion are often linked to menstrual cycle phases. Research has shown that women may perceive their performance as poorer during the luteal phase due to mood disturbances like irritability and fatigue. In contrast, during the follicular phase, women tend to report a higher sense of physical capability and improved performance, despite not always showing measurable differences in objective performance metrics (Constantini et al., 2005). The placebo effect and mental framing also play significant roles in shaping perceived performance, further highlighting the psychological component of menstrual cycle influences.

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4. Methodological Considerations and Limitations

The existing literature on the menstrual cycle and athletic performance is marred by several methodological challenges. Many studies suffer from small sample sizes, lack of control for

confounding variables (e.g., training intensity, sleep, nutrition), and the difficulty of accounting for individual variability in menstrual cycle length and symptomatology. A significant limitation is the lack of standardized protocols for assessing menstrual cycle phases, with many studies relying on self-reported data on cycle phase and symptoms. This can lead to inaccuracies, particularly in cycles that are irregular or influenced by contraceptive use (Ekenros et al., 2022). Furthermore, the overwhelming focus on physiological measures such as strength or endurance often overlooks key psychological variables, such as motivation, mood, and stress perception, which could offer a more comprehensive understanding of the menstrual cycle's impact on performance.

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5. Practical Implications for Athletes and Coaches

Understanding the psychological impact of the menstrual cycle is crucial for female athletes and their coaches to optimize training and performance. A key practical implication is the need for personalized training plans that account for individual menstrual cycle patterns and associated psychological fluctuations. Athletes may benefit from mental strategies such as mindfulness, cognitive-behavioural techniques, or hormonal management strategies to mitigate negative mood states during certain phases. Coaches should be aware of the potential psychological effects of menstrual cycle phases on motivation and stress levels, adjusting training intensities or providing additional mental support as needed (Brown et al., 2021). Moreover, promoting open discussions about menstrual health and its impact on performance could reduce stigma and help athletes better manage cycle-related symptoms.

In summary, while hormonal fluctuations across the menstrual cycle undoubtedly influence athletic performance, the psychological impact is complex and highly individualized. Women

may experience mood disturbances, fatigue, or reduced motivation during certain phases, particularly in the luteal phase. However, individual differences play a major role in determining how the menstrual cycle affects performance, with some athletes reporting little to no impact on their psychological state. Methodological limitations, including small sample sizes and inconsistent reporting of cycle phases, continue to hinder the generalizability of findings. Moving forward, larger, more methodologically rigorous studies are needed that focus on both physiological and psychological outcomes. Additionally, practical strategies should be developed to assist athletes and coaches in optimizing performance while accounting for menstrual cycle variability.

Objectives

To explore and evaluate the psychological impact of the MC on athletic performance, focusing on mood, motivation, stress levels, and mental resilience in athletes, with the aim of providing data to help identify patterns, challenges, and strategies to optimize performance during various phases of the cycle.

Methods

Design

Over the past five years, only 9% of research studies related to athletes have specifically focused on female athletes, in stark contrast to the 71% that have predominantly examined their male counterparts (*Paul RW, Sonnier JH, Johnson EE, et al, 2023)*. This significant disparity highlights an ongoing underrepresentation of female athletes in sports science research. Recognizing this gap, and in light of the success of the Paris 2024 Summer Olympic

Games, where there was a 50/50 split of male and female athletes, a study dedicated exclusively to understanding female athletes was both timely and highly relevant.

The methodology for this study included a structured questionnaire designed to capture a wide range of data from individual athletes, complemented by in-depth, semi-structured interviews. These interviews provided an opportunity to delve deeper into the themes and issues identified in the questionnaires, ensuring a comprehensive exploration of the unique experiences and challenges faced by female athletes.

Terminology

To enhance participant comprehension, terminology used to describe menstrual cycle phases was simplified following consultation with a French midwife practitioner. (In France, midwives play a broader role in supporting women's health throughout their lives, beyond pregnancy care.)

Rather than employing technical terms such as *follicular*, *luteal*, and *ovulatory*, the study used more accessible descriptors, such as "the two weeks preceding your period," "from the first day of your period," and "after your period." This approach was chosen to ensure clarity and facilitate accurate understanding of the menstrual cycle phases among participants.

Enrolment

The participant selection process involved reaching out to a diverse array of high-level sports clubs located in France, as well as leveraging the author's established network of elite athletes.

The eligibility criteria for the study required participants to be female, aged 18 to 35 years, and actively competing at professional, national, or regional level in their respective sports. These requirements were designed to ensure the data would be directly applicable to coaches, sports clubs, and athletic federations.

Fifty participants in France were included, representing nine different sports disciplines. All were competing at high levels, ensuring a sample of highly skilled and experienced athletes. The study encompassed a wide cross-section of sports, namely football (14 participants), rugby (6), athletics (11), volleyball (6), water polo (7), triathlon (1), swim run (2), fencing (2), and basketball (1).

Data Collection

Participants completed a 30-item questionnaire designed to assess the perceived impact of their MC on their athletic performance. Following this, a subset of four participants was randomly selected for in-depth, semi-structured interviews to further explore their perceptions and experiences regarding the influence of their MC on both training and competition performance.

The investigation focused on four key thematic areas:

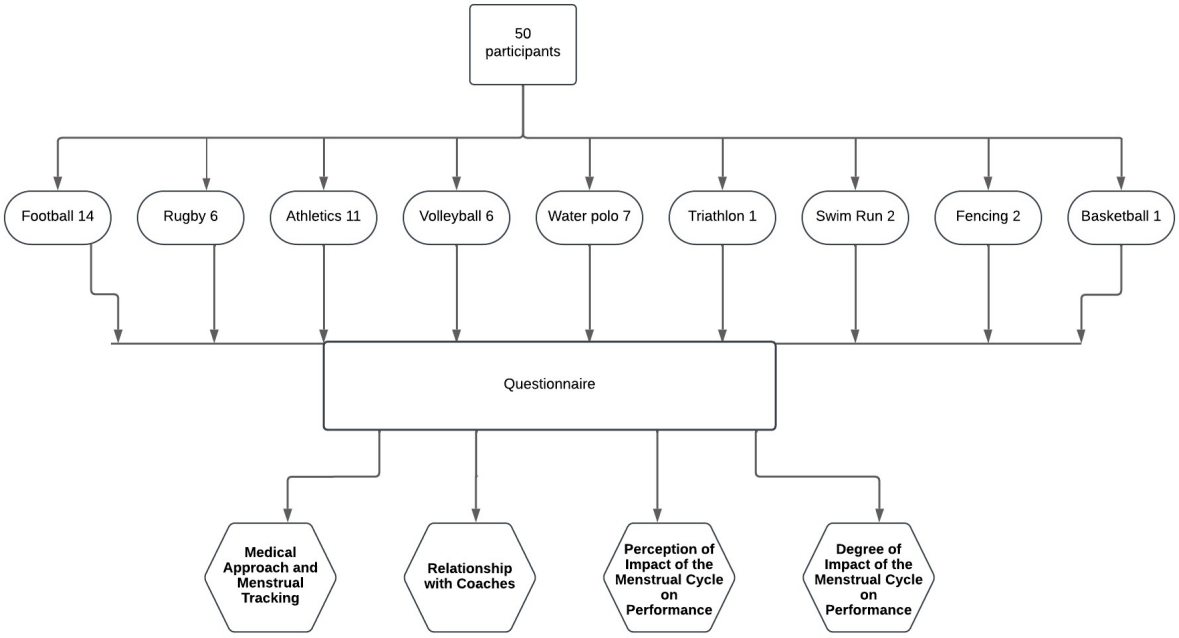
1. **Medical Approach and Menstrual Tracking** – assessing the use of medical resources, monitoring practices, and awareness of menstrual health.
2. **Relationship with Coaches** – exploring communication and support related to MC and its impact on athlete-coach dynamics.
3. **Perception of Impact of the Menstrual Cycle on Performance** – understanding athletes' subjective experiences and beliefs regarding their performance during different phases of the cycle.
4. **Degree of Impact of the Menstrual Cycle on Performance** – quantifying the extent and frequency of the MC's influence on training and competition outcomes.

The questionnaire included a mix of closed yes/no questions and scale-based items to capture the frequency and intensity of the reported effects. This combination of quantitative and

qualitative methods aimed to provide a comprehensive understanding of the psychological and physiological implications of the menstrual cycle on athletic performance.

The questionnaire was written and the interviews were conducted in French, the mother tongue or preferred language of the participants. Responses and discussions were translated into English by the bilingual author.

The questionnaire was designed using Google Forms. Invitations were distributed via email to each participant. Subsequently, the anonymized data were exported to Google Sheets for the generation of statistics and tables.



Results (Supplementary table 1)

1) Medical Approach and Menstrual Tracking

It was deemed essential to ascertain the percentage of athletes who have consulted a healthcare professional—such as a gynaecologist, doctor, or midwife—for issues related to their MC. The results show that a significant majority (56%) have not sought medical advice or assistance for MC-related concerns. Among the athletes who did consult a medical professional, fewer than 15% reported dissatisfaction with the solutions proposed.

Contraception has been explored as a method for regulating the MC. Exactly half of the athletes have used contraception for this purpose, with more than 75% expressing satisfaction with its effectiveness. This suggests that for many athletes, contraception can be a viable and satisfactory approach to managing their menstrual cycle.

Menstrual cycle tracking via mobile applications also emerged as a prominent theme. The results show that 50% of athletes use an app to track their MC, matching the proportion of athletes who reported using contraception. Among app users, satisfaction was almost unanimous, indicating that digital tools may provide a convenient and effective way for athletes to monitor their cycles and anticipate potential impacts on performance.

These findings underscore the variability in how female athletes approach menstrual cycle management, with nearly equal proportions relying on medical solutions, digital tracking, or neither. The high satisfaction rates associated with both contraception and menstrual tracking apps highlight the importance of accessible and individualized options for managing MC-related challenges in sports.

2) Relationship with Coaches

The results indicate that the majority of athletes (80%) reported never having had a direct discussion about their MC with a female coach. This indicates a significant gap in communication regarding this topic, even with coaches of the same gender, who might be expected to offer greater understanding or relatability on the subject.

Conversely, just over one third (34%) of athletes have had direct conversations about their MC with a male coach. This finding is notable, as it suggests that male coaches may be more willing or proactive in addressing this topic than is commonly presumed. It may, however, simply be explained by the increased number of male coaches compared to female coaches.

The disparity between these figures raises important questions about the dynamics of coach-athlete communication on sensitive topics like the menstrual cycle

Combining the two questions, we see that a total of only 38% of participants have had a direct discussion with a male or female coach about their MC. This highlights the need for improved training and resources for coaches of all genders to foster open, supportive, and informed dialogues with athletes. Addressing this gap could play a crucial role in optimizing athlete well-being and performance by ensuring that menstrual health is acknowledged and supported within the coaching relationship.

3) Phases of MC and Perception of Impact

It was considered crucial to understand during which MC phase athletes feel at their psychological best. More than half of the participants (54%) report feeling at their best just after the end of their period, while 28% identify the two weeks preceding their period as the optimal time. Notably, 18% of athletes feel most psychologically balanced during their period itself. This suggests that while many athletes experience psychological fluctuations during their cycle, there is significant variation in the timing of peak well-being.

Conversely, more than two-thirds of athletes (68%) report feeling at their psychological lowest point starting from day one of their period, with 28% feeling similarly low during the two weeks preceding their period. These findings highlight the considerable emotional challenges that athletes may face during these phases, which can potentially affect their overall performance and well-being.

The analysis next delves into emotional instability associated with the MC. While 24% of respondents rarely or never experience emotional instability due to their MC, a more significant proportion (54%) report experiencing emotional instability systematically, regularly, or often. This indicates that for the majority of athletes, the menstrual cycle has a considerable emotional impact, which may require targeted strategies to manage its effects on both training and competition.

The practical implications of the menstrual cycle on athletic participation are of paramount importance. A notable 70% of respondents have never missed a match or competition due to their MC, which indicates that most athletes are able to compete regardless of menstrual-related discomfort. However, the situation is slightly different when it comes to training, as 51% of athletes report missing at least one training session due to their MC. This suggests that while competition may be less impacted, training may be more vulnerable to the physical and psychological challenges posed by the menstrual cycle. Or alternatively that athletes prioritize matches and competition above all else.

These findings emphasize the need for greater awareness and support systems for athletes navigating the psychological and physical effects of the menstrual cycle, particularly during the most challenging phases.

4) Degree of Impact of MC on Performance

The results demonstrate that nearly two-thirds of respondents (64%) experience changes in their self-confidence at various stages of their menstrual cycle. This suggests that fluctuations in self-esteem are a common challenge for many athletes. Conversely, more than two-thirds (66%) of participants report experiencing little to no added anxiety during their MC, pointing to a subgroup of athletes who are less affected by psychological stress during their cycle.

The figures show a near 50/50 split in the response to concerns about re-injury, with 52% of participants expressing varying degrees of apprehension about the potential for re-injury during their MC. This highlights that for some athletes, there is a heightened sense of vulnerability during certain phases of the cycle, potentially influencing their physical performance and training decisions.

Only 4% of athletes report no change in their motivation to train during their MC, while over two-thirds (68%) report some level of fluctuation in motivation, whether minor or substantial. This underscores the significant impact that hormonal and psychological changes during the MC can have on an athlete's drive and commitment to training.

Regarding concentration and focus, there was a near even split between athletes who experience lower concentration levels (54%) and those who report little to no change in this aspect (46%). This finding suggests that while some athletes may struggle with mental clarity during their cycle, others may experience little or no disruption in their ability to concentrate.

Over half (54%) of the respondents experience mood swings that affect their interactions with teammates and coaches, emphasizing the interpersonal challenges posed by menstrual-related emotional shifts. These mood fluctuations may influence team dynamics and communication, highlighting the need for understanding and support within the athlete-coach relationship.

There is an almost even split between athletes who experience changes in their ability to tolerate stress (52%) and those who report no such change (48%). This variation points to the

fact that while some athletes are more resilient during their cycle, others may experience increased sensitivity to stressors, impacting their performance under pressure.

In terms of decision-making ability, the results reveal that 60% of participants experience little to no impact on their ability to make decisions during their MC, suggesting that for the majority of athletes, mental acuity remains unaffected. However, the findings show that more than 80% of athletes report changes in their sleep patterns to varying degrees, which may affect recovery and overall performance during their cycle.

The study illustrates that only 4% of athletes report no change in body image perception during their MC, with more than a half (52%) experiencing significant changes. These findings suggest that body image concerns may be particularly pronounced for some athletes, which could influence their mental well-being and confidence in performance.

The impact of the MC on mental preparation is also examined, where 70% of participants report experiencing some level of disruption in their mental readiness at various stages of their cycle. This suggests that menstrual fluctuations may hinder an athlete's ability to mentally prepare for competition. Similarly, over 85% of athletes report a variation in their ability to handle challenges and hardships during their MC, reflecting the broader psychological and emotional effects of the cycle on resilience.

The data highlight that only 4% of respondents report no change in their perception of effort, while over two-thirds (72%) experience substantial fluctuations in their sense of effort during training or competition. This suggests that menstrual cycles can significantly affect perceived exertion, influencing training outcomes and competition performance.

In terms of competitive spirit, 60% of athletes report little to no change in their competitive drive during their MC, indicating that many athletes maintain their intensity and focus regardless of menstrual fluctuations. However, 82% of participants report experiencing some

change in their ability to handle pressure during competitions or matches, with only 18% reporting no such fluctuations. This highlights the substantial impact of menstrual changes on mental toughness and the ability to perform under pressure.

Furthermore, 86% of athletes report a fluctuation in their mental strength, whilst the results illustrate that an overwhelming 98% of respondents experience some variation in their overall mental well-being during their MC, underlining the pervasive psychological effects that menstrual cycles can have on athletes.

Lastly, 88% of athletes have experienced stress or discomfort when wearing light-coloured clothing due to concerns about leakage or staining, which further reflects the practical and emotional challenges athletes face in managing their MC during competitions and training sessions.

Discussion

Male Coaches / Female Coaches

Prior to conducting this research, the hypothesis was that female athletes would likely feel more comfortable discussing their MC with a female coach, due to a perceived shared experience and understanding. However, the findings from this study revealed an unexpected trend: female athletes were more likely to discuss their MC with a male coach rather than a female one. This could be partially explained by the specific coaching backgrounds of some participants. For example, one track and field athlete, participant 1, shared that she had never had a direct conversation about her MC with a female coach because she had only ever worked with male coaches. This lack of opportunity to engage with female coaches may account for why, in this study, female athletes seemed more inclined to confide in male coaches.

The results align partly with those reported in earlier studies. "Most athletes expressed a reluctance to confide in their coaches with these matters. This was described to be due to several reasons including awkwardness, embarrassment, gender and feeling like there would be nothing that the coach could do to help them" (Findlay RJ et al, 2020).

Impact on performance

Participant 1 further elaborated on her experience in the lead-up to the 2024 Paris Olympics, when her period began on the day of a warm-up competition, just ten days before the Games. She described how it was "highly difficult to be competitive" due to pain, discomfort, and a lack of energy. Together with her coach, they devised a strategy to "limit the damage" and "salvage what we can" from the competition. This shared approach emphasizes the importance of coach-athlete collaboration when menstrual-related challenges arise.

Similarly, participant 2, a triathlete, recounted her experience of racing during a triathlon when her period arrived on the day of a significant competition. She suffered from a lack of energy, decreased performance, and fatigue, describing it as "a horrible experience." She expressed her approach to managing athletic performance, stating, "I try to think about it as little as possible and accept that my condition will be diminished, and therefore my performance won't meet expectations (unfortunately)." This reflects a pragmatic acknowledgment of the physiological challenges posed by the menstrual cycle on competitive performance.

A study in the *British Journal of Sports Medicine* reported that 67% of athletes felt menstrual symptoms negatively affected their performance (Findlay RJ et al, 2020).; however, objective measures often show minimal impact (Carmichael MA, 2021). Further research into the difference between perceived impact and physiological impact would therefore be of great

interest.

Participant 2's sentiments were echoed by participant 3, a water polo player, who explained that, like many athletes, she would "rather not have [her] period during a competition." She expressed how it felt like an added burden, further complicating the demands of the match. Despite this, she mentioned that she did not take special measures to cope and tended to "step back" to avoid being negatively affected by the situation.

Other athletes, such as participant 2, shared their experiences of hypersensitivity, fatigue, and negative self-image during their periods. She noted that water retention and irritability often led her to feel "too heavy" and pessimistic about her potential to succeed. To cope with these challenges, she prioritized the optimization of recovery through rest, including regular naps and reducing mental stress. She also emphasized the importance of addressing her physical well-being as a foundation for maintaining her mental health during her menstrual period. She stated, "For my mental well-being, I start by taking care of my physical well-being (massage, makeup, self-care)." This highlights the role of self-care practices in mitigating the psychological impact of the menstrual cycle on athletes and reinforces prior empirical evidence that athletes have their own strategies and tools to minimize the impact of having their period on the day of a competition. **"…**participants were mostly aware of how they coped with symptoms occurring immediately pre and during menses. This theme comprised three sub-themes: avoidance, acceptance, and planning." (Meijen, C., & Martin, E. A., 2024).

In terms of organizational support, participant 3 noted that her team did not have any specific resources in place to assist with managing the mental or emotional impact of the menstrual cycle, indicating a gap in athlete support systems. She acknowledged that while she did not experience mood swings during her cycle, she was likely more irritable, which reflects how subtle but impactful these changes can be on overall well-being.

These results corroborate previous findings in the field. A commentary in the *Journal of Sports Medicine* highlights that inadequate research, low menstrual health literacy, and lack of educational resources and training are barriers preventing effective menstrual health monitoring for females in sports (Badenhorst CE, 2024).

These findings suggest that the absence of structured support systems within sports clubs can hinder athletes' ability to manage menstruation-related challenges effectively.

Interestingly, participant 3 also stated that, due to the close-knit nature of their team, her fellow players could often tell which teammate was menstruating without the need for verbal communication. In fact, she confirmed that her MC was synchronized with many of her teammates. Menstrual synchrony among teammates is a phenomenon that has been reported anecdotally, but scientific evidence supporting this occurrence is inconclusive. A critical review published in *Psychoneuroendocrinology* (Wilson HC, 1992) examined studies on menstrual synchrony and concluded that methodological errors and biases have led to inconsistent findings, suggesting that menstrual synchrony is not a robust phenomenon.

Participant 2 reported experiencing outwardly recognizable symptoms during her menstrual period. These included a negative effect on body image, appearing fatigued, exhibiting mood changes, and a noticeable decline in motivation and energy levels. These observable symptoms were noted to be apparent to those around her, providing insight into the potential external indicators of menstrual phases in athletes.

These sentiments align with those reported in earlier studies. A narrative review in the *British Journal of Sports Medicine* suggested that body image perceptions during different phases may influence athletic performance (Carmichael MA, 2021)

Participant 4, a rugby player, described how physical activities like tackling can be particularly difficult during her MC. The impact of landing after a tackle or jump can send a "shock wave of indescribable discomfort – and often pain" through her body. This highlights the specific physical challenges faced by athletes in contact sports, where the demands of the sport exacerbate the discomfort experienced during menstruation.

A review in *Frontiers in Sports* highlighted that hormonal fluctuations during the menstrual cycle can influence joint laxity and neuromuscular control, potentially affecting injury risk (Martínez-Fortuny N et al, 2023). However, the specific impact of these hormonal changes on activities such as impact, tackling, falling, and jumping in contact sports remains under-researched. Further studies are needed to understand how menstrual cycle phases influence these specific movements and associated injury risks in contact sports.

Participant 2 expressed viewing her menstrual period as a time of perceived weakness, stating, "My mental state fluctuates, physical appearance fluctuates greatly, and I hate that. Emotions are intensified, pain appears, and my nerves are on edge." This reflects the challenges athletes may face during menstruation, where both physical and emotional changes can significantly impact their sense of well-being and performance.

All participants interviewed in this study acknowledged some form of negative impact from their menstrual cycle at various points, underscoring the wide-ranging effects of menstruation on athletic performance.

Monitoring of MC

From a coaching perspective, P, a football coach of one of the participants, noted that while the coaching staff does indeed monitor players' menstrual cycles, the primary purpose is to understand fluctuations in performance or energy levels rather than to actively adapt training schedules. This reflects a common gap in coaching strategies—while there is an awareness of

the MC’s potential impact, there is less emphasis on developing tailored approaches to manage these changes.

However, an increasing number of coaches and sports organizations are adopting menstrual cycle tracking to tailor training and optimize performance. For instance, former Chelsea FC Women manager Emma Hayes revealed that the club uses a specialist app to adjust training programs based on players' menstrual cycles, aiming to enhance performance and reduce injury risk (Hayes, E, 2020).

Stigmatization of the Menstrual Cycle in Sport

When discussing the stigmatisation of the MC in sport, the majority of participants agreed that significant progress has been made in recent years. Participant 3 shared that "the conversation has evolved significantly, especially in terms of open dialogue," emphasizing that menstrual cycles are no longer treated as taboo. She highlighted positive developments such as initiatives that allow women to take leave if they experience significant discomfort during their periods. This is viewed as a crucial step forward in creating a more supportive and understanding environment for female athletes. Participant 2 noted that discussing menstrual health has become easier over time. However, she acknowledged that stigma remains, particularly concerning premenstrual pain and syndromes. This underscores the persistence of societal barriers that may hinder open dialogue about menstrual health and its impact on athletic performance.

These views support the conclusions drawn in prior research (Tribes for Good, 2024). The stigma of menstruation and the lack of acceptance of menstruators in sports also discourages athletes and therefore affects their confidence and mental health. The perception that people who menstruate cannot participate in sports undermines the ability and the confidence the

athletes may have, indirectly affecting their physical performance as well as their mental health.

The slowly changing attitudes do, however, reflect broader societal shifts towards greater acceptance and understanding of menstrual health, though there is still much work to be done to ensure that all female athletes receive the support they need to perform at their best. Open dialogue, access to resources, and a reduction in the stigma surrounding the MC will be vital for creating a more inclusive and supportive sports culture.

Several athletes emphasized the importance of recognizing menstruation as a valid reason for absence at school or university. This reflects a growing acknowledgment of the physical and emotional challenges associated with menstruation, underscoring the need for greater support and understanding in academic and athletic environments.

As a short-term measure, considering that 88% of athletes report stress or discomfort related to wearing light-coloured clothing during certain phases of their menstrual cycle, implementing straightforward and inexpensive solutions is both feasible and impactful. These adjustments can be quickly adopted by smaller sports clubs with minimal expense, enhancing athlete comfort and well-being.

A study published in the *British Journal of Sports Medicine* also found that athletes reported menstrual cycle-related issues affecting their training and competition, with some expressing concerns about menstrual leaks during performance (Findlay RJ et al, 2020)

The philosophy of marginal gains, as championed by Sir Dave Brailsford, British sports coach and performance strategist renowned for revolutionizing professional cycling, emphasizes achieving significant performance benefits through small, incremental improvements across various domains (Clear J, 2015). While this approach has been transformative in optimizing factors like nutrition, equipment, and recovery, the menstrual cycle remains an overlooked

area in performance optimization frameworks, despite its significant physiological implications for nearly half the athletic population.

Research has shown that hormonal fluctuations across the menstrual cycle can influence factors such as endurance, power, and perceived exertion (McNulty et al., 2020). However, these insights have yet to be systematically applied to training and recovery strategies. Our findings highlight the potential for tailored approaches that align training loads and recovery practices with hormonal variations, offering a promising avenue for achieving marginal gains in women's sports.

Brailsford's emphasis that "The whole principle came from the idea that if you broke down everything you could think of … and then improved it by 1%, you will get a significant increase when you put them all together" (Brailsford, 2012) underscores the opportunity here. Just as innovations in aerodynamics and recovery have transformed performance, integrating MC tracking and adaptation into training could represent a pivotal step forward. Future research should explore how these strategies impact long-term performance outcomes, contributing to a more inclusive and evidence-based approach to athletic optimization.

Conclusion

This study aimed to evaluate the psychological impact of the MC on athletic performance, with the goal of identifying patterns, challenges, and strategies to optimize performance across the various phases of the cycle.

The findings reveal that most athletes experience fluctuations in their mental approach to sport, manifesting as changes in sleep patterns, motivation, concentration, effort thresholds, and levels of anxiety and stress. These psychological shifts can significantly influence mental states and performance outcomes.

While some athletes, coaches, and sports organizations track MCs, this practice is not universally adopted, and the data collected are seldom integrated into training or preparation plans. This study highlights the importance of addressing the psychological effects of the menstrual cycle within athlete care and training programs, aiming to enhance both well-being and performance. By increasing awareness, coaches, sports organizations, and athletes can better understand the menstrual cycle's impact and create individualized training regimens tailored to athletes' needs.

It is crucial to recognize that individual perceptions of menstrual-related discomfort vary widely, influenced by factors such as baseline mental health, genetic predisposition, fatigue, lifestyle, and menstrual disorders such as dysmenorrhea or premenstrual dysphoric disorder (PMDD).

Future research should combine psychological evaluations with hormonal measurements to establish more definitive correlations between menstrual cycle phases and athletic performance. Additionally, further investigation into effective interventions to manage the psychological impacts of the menstrual cycle in athletic contexts is warranted.

Ethics Statement

Under the French legal framework, the study is not subject to the provisions of the Jardé Law and, therefore, does not require review by an ethics committee. Additionally, the study is not governed by the "Informatique et libertés" law, and as such, does not necessitate a declaration with the CNIL (Commission Nationale de l'Informatique et des Libertés).

This study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki. Prior to participation, all athletes received a detailed explanation of the study's

aims, procedures and benefits. Written informed consent was obtained from all participants, who were assured of their right to withdraw from the study at any stage.

Confidentiality and privacy were prioritized throughout the research process. All identifying information was anonymized. Data were securely stored on password-protected systems, accessible only to the research team, in compliance with the General Data Protection Regulation (GDPR). No personal information was shared with third parties.

Every effort was made to ensure the physical and psychological well-being of participants. Participants were offered the opportunity to review the findings upon conclusion of the study to promote transparency and trust.

Declaration of interest statement

No known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Contributors

The author would like to thank all who volunteered to participate in this study.

Consent for publication

Explicit consent provided. All data anonymised.

Data availability statement

Data are available upon reasonable request. The data that support the findings of this study are available on request from the corresponding author, Scott Gilmour, via email: sgilmour@hotmail.com.

The data are not publicly available due to their confidential nature and despite all transcribed data being kept in a deidentified form, the data still contain information that could compromise the privacy of research participants.

References

Badenhorst CE. The Menstrual Health Manager (MHM): A Resource to Reduce Discrepancies Between Science and Practice in Sport and Exercise. Sports Med. 2024 Nov;54(11):2725-2741. doi: 10.1007/s40279-024-02061-w. Epub 2024 Jun 21. PMID: 38904920; PMCID: PMC11561008./

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

Carmichael MA, Thomson RL, Moran LJ, Wycherley TP. The Impact of Menstrual Cycle Phase on Athletes' Performance: A Narrative Review. Int J Environ Res Public Health. 2021 Feb 9;18(4):1667. doi: 10.3390/ijerph18041667. PMID: 33572406; PMCID: PMC7916245.

Clear J. (2015). This Coach Improved Every Tiny Thing by 1 Percent and Here's What Happened**,** Retrieved from James Clear's Website, https://jamesclear.com/marginal-gains

Constantini, N. W., Dubnov, G., & Lebrun, C. M. (2005). The Menstrual Cycle and Sport Performance. *Clinics in Sports Medicine*, *24*(2), e51–e82. https://doi.org/10.1016/j.csm.2005.01.003

Ekenros, L., von Rosen, P., Solli, G. S., Sandbakk, Ø., Holmberg, H.-C., Hirschberg, A. L., & Fridén, C. (2022). Perceived impact of the menstrual cycle and hormonal contraceptives on physical exercise and performance in 1,086 athletes from 57 sports. *Frontiers in Physiology*, *13*, 954760. https://doi.org/10.3389/fphys.2022.954760

Findlay RJ, Macrae EHR, Whyte IY*, et al* How the menstrual cycle and menstruation affect sporting performance: experiences and perceptions of elite female rugby players *British Journal of Sports Medicine* 2020;**54:**1108-1113

Hayes E, Chelsea FC, 2020, Chelsea Women tailor training to players' menstrual cycles, Retrieved from https://www.chelseafc.com/en/news/article/chelsea-women-tailor-training-to-players-menstrual-cycles

Martínez-Fortuny N, Alonso-Calvete A, Da Cuña-Carrera I, Abalo-Núñez R. Menstrual Cycle and Sport Injuries: A Systematic Review. Int J Environ Res Public Health. 2023 Feb 13;20(4):3264. doi: 10.3390/ijerph20043264. PMID: 36833966; PMCID: PMC9958828

McNulty KL, Elliott-Sale KJ, Dolan E, et al. The Effects of Menstrual Cycle Phase on Exercise Performance in Eumenorrheic Women: A Systematic Review and Meta-Analysis. *Sports Med*. 2020;50(10):1813-1827. doi:10.1007/s40279-020-01319-3

Meijen, C., & Martin, E. A. (2024). 'I don't want to be seen as period prone': An exploration of psychological strategies used across the menstrual cycle. International Journal of Sports Science & Coaching, 19(6), 2366-2375

Paul, R. W., Sonnier, J. H., Johnson, E. E., et al. (2023). Inequalities in the evaluation of male versus female athletes in sports medicine research: A systematic review. *American Journal of Sports Medicine, 51*(12), 3335-3342.

Reed, S. C., Levin, F. R., & Evans, S. M. (2008). Changes in mood, cognitive performance and appetite in the late luteal and follicular phases of the menstrual cycle in women with and without PMDD (premenstrual dysphoric disorder). *Hormones and Behavior*, *54*(1), 185–193. https://doi.org/10.1016/j.yhbeh.2008.02.018

Sanchez, B. N., Kraemer, W. J., & Maresh, C. M. (2023). Premenstrual Syndrome and Exercise: A Narrative Review. *Women*, *3*(2), Article 2. https://doi.org/10.3390/women3020026

Slater, M. (2012). Olympic cycling: Marginal gains underpin Team GB dominance. Retrieved from http://www.bbc.co.uk/sport/0/olympics/19174302 .

Strine, T. W., Chapman, D. P., & Ahluwalia, I. B. (2005, May 25). *Menstrual-Related Problems and Psychological Distress among Women in the United States* (2 Madison Avenue Larchmont, NY 10538 USA) [Research-article]. Https://Home.Liebertpub.Com/Jwh; Mary Ann Liebert, Inc. 2 Madison Avenue Larchmont, NY 10538 USA. https://doi.org/10.1089/jwh.2005.14.316

Tribes for Good, (2024). The impact of menstruation on female athletes. https://www.tribesforgood.com/periods-in-sports-impact-of-menstruation-on-female-athletes

Wilson HC. A critical review of menstrual synchrony research. Psychoneuroendocrinology. 1992 Nov;17(6):565-91. doi: 10.1016/0306-4530(92)90016-z. PMID: 1287678

Witkoś, J., & Hartman-Petrycka, M. (2021). The Influence of Running and Dancing on the Occurrence and Progression of Premenstrual Disorders. *International Journal of Environmental Research and Public Health*, *18*(15), Article 15. https://doi.org/10.3390/ijerph18157946