

ORIGINAL ARTICLE

Elite female athletes' experiences and perceptions of the menstrual cycle on training and sport performance

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The purpose of the current study was twofold (a) to examine elite female athletes' experiences of their menstrual cycle, with a focus upon the impact on training and competition performance and (b) the openness of conversation pertaining to the menstrual cycle with coaching and support staff. Following receipt of institutional ethical approval, individual semi-structured interviews were conducted with 17 elite female athletes (25.5 ± 4.7 years) from multiple sports. Results revealed athletes' experiencing a natural menstrual cycle reported physical symptoms alongside mood disturbances and reduced motivation to train. The decision to actively control the menstrual cycle was often triggered by a desire to reduce the effect on competition, to lessen anxieties about making required weight or reduce distraction to manage during competition. Athletes indicated an openness to talk about the menstrual cycle to other females, however, there was variation in the comfort athletes experienced regarding talking to male coaches. Overall, the findings highlight the need to educate elite athletes and coaches on the menstrual cycle, considering it in the same light as other physiological functions in sport to improve health, well-being, and performance. Furthermore, providing education on how to construct positive conversations, equipping individuals with the correct terminology, and confidence to talk about the menstrual cycle will reduce some reservations identified through improved knowledge and understanding.

KEYWORDS

athletes, female, menstrual cycle, performance, symptoms

1 | INTRODUCTION

The female reproductive life cycle is one of the most important biological rhythms¹ with the menstrual cycle being a perfect example of a bio-psycho-social process; it is a normal aspect of physiology that both affects and is affected by behaviour.² However, research has shown that many females feel advice and information they receive is focussed on the biology of menstruation and suggest this should be shifted to personal, subjective, and lived experiences.³ The

literature to date has concentrated on the biological process involved in the menstrual cycle, with emerging research on the impact of sport performance, yet personal and lived experiences have infrequently been investigated. This may result from menstruation remaining a hidden topic, rarely spoken about and also considered a topic of shame and embarrassment.⁴ Reports have highlighted menstrual stigma still existing and considered an educational and socioeconomic issue across the world; a survey identified 1 in 4 girls did not feel they knew what to do when they started

their period, with 48% of girls feeling embarrassed by their period.⁴ Despite a number of international campaigns focusing on breaking down the stigma, this still exists within sport and wider society.

For the body to function properly, its various parts and organs must communicate with each other to ensure that a constant internal environment (ie, homeostasis) is maintained. Communication among various regions of the body is essential for enabling the organism to respond appropriately to any changes in the internal and external environments.⁵ Hormonal communication relies on the production and release of hormones from various glands and on the transport of those hormones via the bloodstream. Specifically, hypothalamic hormones play pivotal roles in the regulation of many functions including eating and drinking, sexual functions, behaviors, blood pressure and heart rate, body temperature maintenance, the sleep-wake cycle, and emotional states (eg, fear, pain, anger, and pleasure).⁵

The menstrual cycle is the result of the actions of the hypothalamic, hypophyseal, and ovarian hormones bringing about various changes in the female reproductive system and many other tissues of the body.¹ The menstrual cycle encompasses two main phases associated with fluctuating levels of hormones, the follicular phase, and the luteal phase. Besides from reproductive function, female sex hormones are known to affect numerous other cardiovascular, respiratory, thermoregulatory, and metabolic parameters.⁶ Therefore, at each stage of the menstrual cycle, throughout a cycling month, it can theoretically affect sporting performance in different ways. However, the effects of the menstrual cycle (and the associated hormonal fluctuations) on sporting performance have largely been unaccounted.⁷ And while more studies are starting to emerge, there are still many questions with indefinite answers. Further disparity exists when considering contraceptives. With the primary aim to prevent pregnancy, the change in physiology resulting from exogenous hormones may affect sporting performance.⁸ The literature is confounded by the complexity in the various contraceptive types, containing differing levels of hormones; some are estrogen and progestin (combined pill), whereas others contain progestin only (mini pill, implant, mirena coil, injection). The different forms of contraceptives can result in the prevention or increase in symptoms experienced by female athletes.⁸

Understanding the impact of the menstrual cycle on exercise for females is critical for sport professionals and coaches to appropriately prescribe training, alongside ensuring optimal health and well-being.⁹ Specifically, estrogen can influence the cardiovascular system, substrate metabolism, and the brain.¹ Whereas, progesterone and other progestins appear to mainly affect thermoregulation, ventilation, and the choice and use of fuel for energy

needs.¹ All of these factors associated with the menstrual cycle can impact on athletic performance. Additionally, O'Brien, Rapkin, Dennerstein & Nevatte¹⁰ evidenced psychological and behavioral symptoms associated with the menstrual cycle can include fatigue, lethargy, poor coordination, and concentration; all factors which may impact upon sport performance.

Research informing practitioners of best-practice methods for maximizing exercise performance and training adaptation in females are limited.⁹ Emmonds et al¹¹ highlight evidence informed approaches remain a challenge for those working in female sport, with a lack of sport science and medicine research conducted on elite female athletes. Research highlights 51.1% of elite British female runners and rowers felt their menstrual cycle had in some way impacted upon their training and performance⁷ in contrast, Olympic medal-winning performances have taken place during all phases of the cycle.¹² There is much variation in individual symptoms, and subsequently, there is a need to understand individual lived experiences and perceptions. It is valuable to understand how the menstrual cycle is perceived to impact on training and competition, rather than group averages, to influence best practice and optimize support provided by coaches and practitioners to resolve issues relating to health, well-being, and sporting performance.¹³

Despite the menstrual cycle potentially influencing a number of physiological and psychological constructs as previously highlighted, we are yet to establish an open environment in which the menstrual cycle is discussed equally with any other physiological determinants within sport performance.⁷ This lack of consideration may be attributed to a variety of factors, either the limited research within this area or resulting from athletes' individual experiences of their menstrual cycle and their discomfort having conversations on this topic with members of their support network as highlighted by Findlay et al¹⁴ noting female rugby players felt unease having menstrual cycle conversations with male support staff. Women still try to conceal they are menstruating or experiencing premenstrual symptoms, this negative attitude toward menstruation has been reinforced by-products and media. It is important to recognize that through advertising and the power of social media, the messages put forward by large corporations can impact on perceptions. Many adverts for menstrual products have a consistent theme, namely emphasizing the importance of secrecy, implying dirtiness and the need to avoid social embarrassment.⁴ This is a powerful message to readers and viewers that they should keep the evidence of menses out of sight.¹⁵ Johnston-Robledo & Chrisler¹⁵ identified booklets used to educate girls before menarche might learn more about stigma than about their physiology. One booklet stated "your main concern will probably be avoiding accidents...and using a pad that doesn't show." The emphasis

on secrecy and the potential for embarrassment is present in many of the booklets, and this emphasis may contribute to negative attitudes toward menstruation.¹⁶

The communication taboo is supported by the existence of dozens of euphemisms for menstruation. If there was an open environment to talk about menstrual blood, there would be no reason to call it anything other than menstruation or menses.¹⁷ Within elite team sport, one study identified that some athletes have expressed a reluctance to confide in their coaches relating to the menstrual cycle due to reported awkwardness, embarrassment, gender differences, and feeling like there would be nothing that the coach could do to help them.¹⁴ Communication is a fundamental part of coaching, yet when focussing on the menstrual cycle, previous research has highlighted male coaches, compared to female coaches, reported it was less important to ask athletes about menstrual irregularity, being less comfortable communicating with female athletes about the topic.¹⁸ Female athletes in high-performance sport are more likely to have a male coach, and therefore, research has questioned whether coaches are sufficiently prepared to respond on a more individual basis to their athletes along the lines of gender.¹⁹ Male coaches may adjust their coaching practices to the detriment of their female athletes.²⁰ Furthermore, previous research has highlighted, coaches of elite athletes are expected to coordinate the communication between the different members of the support team and to plan and prepare for long-term development and participation in elite competition. This requires communicating with people to optimize performance within a mindful environment²¹; the absence of communication between coach and athletes pertaining to the menstrual cycle may have a consequential impact on sport performance. The impact of (unequal) gender relations and the significance of gendered ideas and expectations may currently influence the effectiveness of coach-athlete relationships.²⁰ Fundamentally, Johnston-Robledo & Chrisler¹⁵ commented, if menstruation were discussed more openly, it might be easier for girls and women to acknowledge the positive aspects of menstruation.

There is a great need for continuing research in this area in carefully designed studies, including understanding athletes' experiences in relation to their perceived impact of the menstrual cycle on performance and their ability to discuss this with others. Research needs to further increase knowledge and understanding of individual lived experiences across multiple sports, while promoting conversations relating to the menstrual cycle. This study aimed to produce a paper that provided a substantive contribution to the understanding of elite female's athletes by examining:

1. Elite female athletes' experiences of their menstrual cycle, with a specific focus upon the perceived impact it has on training and competition performance.

2. The openness of conversation pertaining to the menstrual cycle with coaching and support staff.

2 | METHOD

To address the aims of this study and facilitate an in-depth understanding of elite female athletes' experiences, a qualitative descriptive study was conducted.^{22,23} Interpretive descriptive studies seek to gain in-depth insights from participants pertaining to their experiences, while producing descriptive accounts that remain close to the participant's words and produce insights that may be useful in practice. Given the aim of this study was to produce data that could stimulate and encourage conversations among athletes, this approach was deemed particularly valuable. Such studies generally use a combination of purposive sampling, data collection through unstructured or semi-structured interviews, and a variant of qualitative content analysis.^{22,23} As such, these approaches to data collection and analysis methods were used within the current study.

Qualitative description is not underpinned by any specific philosophic foundations other than being guided by the general tenets of naturalistic inquiry.²² The current study, however, was positioned within the interpretivist paradigm, underpinned by ontological relativism and epistemological constructionism. That is, within this study, it was assumed that reality is multiple and subjective and that knowledge is socially constructed.²⁴ Thus, it is recognized that each participant will have their own unique experience of the phenomena and that there is no one truth or experience. Rather, the results of this study illustrate the co-constructed experiences of the participants and the research team, highlighting both shared/common patterns in experiences and individual differences.

2.1 | Participants

Seventeen elite female athletes (age 25.5 ± 4.7) from a range of sports (Table 1) were purposefully sampled based on (a) sex (biologically menstruating females), (b) identifying as female, (c) their level of competition experience, and (d) the length of time participating and competing in their sport. It is important to note sex versus gender differences; sex describes biological differences including genetic, hormonal, and physiological factors in comparison to describing gender, in which social constructs interact.²⁵ It has been acknowledged that not all people who were assigned female at birth, or who identify as female, menstruate. Conversely, there are people who identify as genders other than female (such as transgender, intersex, and non-binary people) who also menstruate.⁴ For this reason, and

TABLE 1 Participant demographics

Participant age (yrs)	Sport	Gender of coach	Abbreviation
18	Weightlifting	Female	W1
26	Weightlifting	Male	W2
19	Weightlifting	Male	W3
25	Weightlifting	Male	W4
28	Weightlifting	Male	W5
26	Weightlifting	Male	W6
28	Athletics	Male	A1
29	Climbing	Male	C1
23	Climbing	Male	C2
28	Climbing	Male	C3
34	Climbing	Male	C4
32	Climbing	Male	C5
17	Climbing	Male	C6
28	Climbing	Male	C7
24	Climbing	Male	C8
21	Gymnastics	Female	G1
28	Judo	Male	J1

the focus of the current study, both biologically menstruating and identifying as female were inclusion criteria for this study.

All sports except climbing required competing at British level or above for a minimum of 3 years, with all having competed at Gold Coast Commonwealth Games 2018. Female climbers were selected based predominately on outside climbing grade achieved; minimum of climbing grade 8a was required, with six participants having climbed 8b or above and all having bouldered V10 or above. All athletes interviewed were in a pre-competitive phase of training. In alignment with Patton,²⁶ these criteria were applied to ensure information-rich participants were sampled to learn about matters of central importance to the purpose of this study, focusing specifically on elite female athletes experiences of their menstrual cycle and openness of conversation. This allowed for greater insights and in-depth understanding to be obtained in relation to the questions under study.

2.2 | Procedure

Following receipt of institutional ethical approval, the lead researcher contacted coaches and sport science practitioners working with each sport to facilitate organization of the research project, forwarding details of the study. Interested female athletes provided contact details to the research team, and suitable times for an interview were arranged.

Prior to the interview, both written and verbal explanation of the study was provided and participants were given the opportunity to ask questions. It was re-emphasized that participation was voluntary, and there were no right or wrong answers to the questions. Once informed written consent was provided by all participants, the participants were asked to provide, through a short written survey, some key pieces of demographic information such as their age, years in the sport and information regarding their menstrual cycle and contraceptive products being used. This short written survey was used to ensure all necessary demographic information was collected without distracting from the flow of the interview. Additionally, having this information at the outset of the interview ensured the interviewer could ask appropriate questions relating to the form of contraceptives being used by the participant. Before interviewing the female athletes, the interview guide was piloted with three recreationally active females to assess whether questions elicited sufficient depth, while allowing the interviewer to practice use of clarification of questions. Following the pilot interviews, several changes were made to the interview guide specific to participants taking contraceptives and provided a more comprehensive history and experience of taking this in relation to training and sport performance.

The final interview guide started with introductory questions, followed by main questions and finished with requested information from female athletes. Introductory questions sought to identify demographic information such as age, duration and level of involvement within their sport. Participants were then asked main questions about their lived experiences of the menstrual cycle, if and how this had changed with age and perception of the menstrual cycle in relation to their training requirements and competitions. This progressed onto openness of conversations about their menstrual cycle with coaches and individuals within their support network. Following this, participants were given the opportunity to request any information or support they had questions about or felt lacked knowledge on in relation to their menstrual cycle (see Appendix). Following introductions and discussions regarding the purpose of the study, all interviews lasted between 34.1 and 62.5 min ($M = 47.1$ min). The first author was responsible for conducting all interviews due to familiarity established while working within their sports and training environment. Through such engagement, the first author gained a greater understanding of the individuals sporting context and environment which facilitated the development of rapport with the participants and aided understanding of the experiences they were describing. It was hoped that the participants would feel more comfortable and openly discuss their thoughts and experiences relating to the menstrual cycle. The first author's background is also worth

noting, working in sport science, as well as personal experience of sports such as climbing, helped relate and further understand experiences described.

2.3 | Data analysis

Each interview was audio-recorded and transcribed by a professional transcribing service. Transcripts were checked for accuracy and any personal identifying information was removed, these were then re-read by the first author to ensure immersion in the data. The transcripts from each participant were analyzed by the first author using qualitative data analysis procedures recommended by Miles, Huberman & Saldana.²⁷ Data reduction was completed using three stages of coding. Firstly, descriptive codes were assigned to the data to identify raw data themes, this allowed for interpretive codes to be generated. These codes grouped descriptive codes into more abstract concepts. Lastly, pattern codes were identified which recognized relationships between interpretative codes.

2.4 | Methodological rigor

Techniques were conducted during and following analysis to enhance the rigor of data analysis. First, the results were produced by researchers working as a team, the second author questioned the analysis and asked for explanations and justifications for the codes produced. The next analytic step involved the second author, questioning raw data themes, this resulted in some reorganization of the grouping of the themes but not of the coding itself. This was repeated by the third author. The final phase of analysis was the writing of the results section because writing is viewed as part of the analysis in qualitative research.²⁸ The final results, which are presented below, were evaluated, discussed, and agreed

upon by all three members of the research team. Although the basic themes remained the same, the written presentation of these themes went through several iterations before the final representation of the results was agreed upon. Credibility and transparency were sought through pilot interviews, engagement with individuals within each sport, and detailed interviews to gain broader insights beyond the interview data. Maintaining the same interviewer ensured the nature of the interview, and in particular, the delivery of questions was kept relatively constant across all female athletes.

3 | RESULTS

Elite female athletes discussed a range of factors related to the menstrual cycle, although in some instances there was limited awareness of the impact the menstrual cycle may have on sport performance. Despite the somewhat limited awareness, all female athletes reported symptoms associated with the menstrual cycle which affected training more so than competition. Conversations with coaches and support staff varied between athletes, with experiences of previous awkward conversations influencing comfort and openness to future conversations. Overall, a word document of approximately 111 613 words of transcribed text was analyzed. Through analysis, 13 sub-themes and four main themes were developed: (a) symptoms experienced, (b) menstrual cycle impact on training and competition, (c) coping (or not) strategies of the menstrual cycle, and (d) openness of conversations (Table 2); each of these is discussed below. Descriptive menstrual cycle data and hormonal contraceptive use are displayed in Table 3; five athletes reported to be currently using a form of hormonal contraceptive (29%). Across all females, 71% reported experiencing abdominal cramps, other symptoms of bloating (65% reported), and agitated/irritability (59%) were the next most commonly reported symptoms associated with

TABLE 2 Themes

Overarching theme	Sub-themes
Symptoms	Physical, affective and psychological Change with age Contraceptives
Impact on training and competition	Training awareness Training alteration Competition acceptance Competition medical intervention Competition distraction
Coping (or not) strategies	Support Management Mentality
Openness of conversation	Coach gender External factors

TABLE 3 Menstrual cycle status characteristics

Menstrual cycle history	
Mean age at menarche (years)	13 ± 1.7
Mean frequency of menses (days)	30.6 ± 4.2
Mean duration of menses (days)	4.75 ± 1.1
Heavy menstrual bleeding	1
Athletes tracking their menstrual cycle	9
Hormonal contraceptive history	
Currently using hormonal contraceptives	5 athletes
Type of contraceptive used	Combined pill; n = 1 Implant; n = 1 Mirena coil; n = 2 Mini pill; n = 1
Previous use of hormonal contraceptives	3 athletes

the menstrual cycle. Furthermore, female athletes discussed information they deemed valuable to receive about the menstrual cycle to improve knowledge and awareness which was grouped into 5 key areas: (a) contraceptives including side effects, long-term health impact and effect on training; (b) menstrual products, what options are there and any products which are preferential for different sports; (c) how the menstrual cycle can affect training and competition and management strategies for these; (d) coach education, improving awareness and understanding; and (e) information for younger athletes and opportunities/advice of who to talk to.

3.1 | Symptoms

All athletes reported symptoms relating to their menstrual cycle: physical, affective, or psychological. These symptoms were associated with both a natural cycle or taking contraceptives, irrespective of tracking their menstrual cycle and were reported to occur at different times within a cycle, having a greater or lesser effect. In general, the week before menses to the end of menses was the timeline in which negative symptoms were experienced. Symptoms were also reported to change with age as one weightlifter explained, “my periods were definitely worse when I was a teenager” (W2), and also the awareness of symptoms increasing with age. For instance, some participants had not initially associated their symptoms to their menstrual cycle but through experience, tracking, and recording, their awareness and understanding had increased “I have become more aware dealing with it [psychological symptoms] but before I was just ‘I must just be grumpy’ I never really related to it, just lack of knowledge. Until I was 18 or 19 it was just the last thing on my mind so I’d never

TABLE 4 Reported physical symptoms

Symptoms	
Cramps/pain	Weight gain
Heavy bleeding	Sleep disturbance
Bloating	Poor temperature regulation
Sick/nauseous	Tiredness
Low energy/lethargic	Change in breast size
Uncoordinated	Ill/cold symptoms
Bad skin	Headache
Fainting	Dizziness
Lower back pain	Gastrointestinal disturbance

even considered it” (C2). Another female athlete described “it never crossed my mind, before I didn’t even know it could affect your performance...I wouldn’t even correlate it and join the dots and have the awareness to adjust training” (W5).

All females reported experiencing at least two of the physical symptoms listed in Table 4 with the most common being cramps/pain (71%). In contrast, not all athletes reported affective and psychological symptoms: those reported included increased worry, unusually stressed, easily frustrated, reduced motivation to train, disengaged, moody, agitated/irrational, reduced confidence, depressed, and increased emotion (crying). Awareness of these symptoms appeared to be more variable and were frequently recognized in older athletes who had a menstrual cycle for a longer time. Variability of symptoms from one cycle to the next was expressed by some participants; “one month one thing will happen, the next month something else will happen...it makes it difficult to be aware and have conversations as its difficult to explain” (A1).

Physical symptoms were generally reported to occur immediately prior to or at the start of menses, whereas affective and psychological symptoms were generally greater the week prior to the onset of menses. The varying extent of symptoms affected female athletes and how they felt, with athletes generally perceiving their menses as “nightmare, it’s horrible” (C2), “feel like an actual blob” (C3), “I feel blah, I feel heavier” (C4), “feel a bit lousy, once it comes its absolutely fine” (C6), and “first day is always pretty grim, I just feel terrible” (C8).

Some athletes reported the use of contraceptives to manage associated physical symptoms such as cramps and dermatology issues. Although some participants reported the convenience of not having menses or withdraw bleeds due to contraceptives, others described negative experiences or symptoms, with some participants not being aware that symptoms were a consequence of the contraceptives, as one participant summarized:

When you start looking more into symptoms, it’s hard because I think a lot of women, myself included, have been on contraception for so long

and from a young age...and it's so normalized that it's very hard to notice [symptoms]. But having come off it I feel I was very flatlined just like I was quite a bit below par and unresponsive [in emotions and to train].

(C3)

Other females reported different side effects; for instance, a weightlifter identified she was more emotional, had continual bleeding, dermatological issues, and food cravings resulting in no longer taking a contraceptive pill "because [I was] emotional it was completely ruining my training" (W4). Meanwhile, other athletes reported associated symptoms of headaches, incredibly painful periods, and concern about the long-term effects of very low hormone levels "I think my cramps are a bit worse but I don't get the headaches any more, that is why I came off the pill because of the headaches, well side effects really" (C1).

3.2 | Impact on training and competition

The symptoms associated with the menstrual cycle impacted on athletes during both training and competition. Athletes' perception of the impact of the menstrual cycle on performance varied and, in some instances, athletes lacked awareness of how it may impact "I didn't even know it could affect your performance, it never crossed my mind when I was younger" (W5). For instance, many of the athletes initially reported no impact of their symptoms on training, yet the majority followed up with statements such as their menses/premenstrual syndrome symptoms left them feeling "out of action," "feel rubbish," and "sluggish during training". As the interviews evolved, an impact on training became more notable, with a large proportion of participants reporting feeling slower and lethargic during training, often lacking motivation to go in the first place as one weightlifter summarized, "I'd rather eat chocolate and watch TV on the sofa" (W2).

Physical symptoms of pain, bloating ("it's annoying for performance, more like core performance and impact of bloating" C3), reduced coordination and core strength ("it has an affect on core strength, can't hold myself in [to the wall] and being able to use core tension to move and sustain the movement to hold it properly" C2) resulted in multiple female athletes either missing training or adjusting it to reduce complex movements, reducing weights lifted or volume completed. One female athlete reported:

If I'm feeling rotten or low on motivation I'll cut the session and move training to another day, instead I will do something active but not very energy requiring. It's all of the powerful stuff

that I'll reduce down as I'm not as strong at that time because I'm not feeling it.

(C6)

There was increased discomfort completing specific techniques, for example in weightlifting the bar hitting the lower abdomen when feeling bloated was reported to be uncomfortable "especially snatch, if you're bloated and snatch is in your hip crease and you smack yourself with the bar, it's such an uncomfortable thing" (W5). Medication was sometimes used to enable continuation of training from physical symptoms of pain/cramps. Psychological and effective symptoms also impacted on training; "I found it had a lot of effect on motivation and energy levels, or just being happy enough to go and climb, because I'd be so worn down one week of the month I'd just be like, 'I can't do anything' so I just wouldn't train"(C2).

Exercise requiring simple movement patterns with lower energy requirement were preferred with reduced intensity "if you are experiencing symptoms, you're much better off doing less technical, some accessory work instead" (W5). However, if training was adjusted, athletes frequently reported to "make up" these sessions on an alternative day, usually once menses had started because, "time before my period impacts training and performance, once I'm on [menses] its just the inconvenience of bleeding" (C6). Overall, it appeared the athletes felt training was not impacted because they were able to change the training, but they did not appear to realize that changing sessions does mean the menstrual cycle is affecting training.

Some common themes from female athletes during competition where it did have an impact were the anxiety of flooding/leaking while performing in a singlet or leotard and in some instances caused a distraction or lack of confidence during competition "So you are always like 'oh my god have I leaked' so the paranoia of leaking is horrible and distracts you" (W2), "it's another thing to manage" (C4). For one athlete, this caused great frustration, sharing:

Just coming through [leaking] is the worst bit. We were doing a [bent over] row and I did a really good one I was like dead on the floor, but I could see they were all looking at me and I thought that was because I was doing a really good [bent over] row and then after I was like ah, 'that's why they were looking at me' [menses leaking] and it takes away from your performance. It was a really good performance and people won't remember that. I didn't feel embarrassed I was just angry.

(W1)

However, in some instances it was reported that some of athletes best performances were achieved while bleeding, "I've

actually had some of my best results competing on my period” (C6).

Climbing outside offered a different perspective, for some female athletes climbing high grades outside was their performance requirement. For these athletes, they commented on the self-regulation of when they are performing, and therefore, if they are experiencing premenstrual symptoms, they can opt to not perform that day unlike pre-determined, organized competitions in other sports (unless external factors of weather or travel were influential). Alternatively, climbing outside can be inconvenient when experiencing menses as there are no toilets and facilities to change menstrual products or dispose of them, which has influenced the choice of menstrual products used by these climbers. Participant C3 explained that being, “in the middle of nowhere on this new routing mission, filming as well and you're just like ‘oh this is not a good time, there were no bins, like nothing, no bins, no toilets, no showers. I was just camping, and I was like oh God’”. Climbers also reported feeling “less confident as well with climbing. Like I’m definitely more in terms of the words coming out of my mouth, I’m like ‘I just can't do it’” with the element of risk and fear being more enhanced when experiencing premenstrual symptoms impacting on performance.

3.3 | Coping (or not) with the menstrual cycle

Participants have adopted different approaches and strategies to manage their menstrual cycle in relation to training and competition when aware of the impact. Participants were more aware of the impact of their cycle on competitions, with participants choosing one of two approaches to manage it: acceptance or find ways to adapt. The approach to competition was either “just get on with it” as demonstrated by one gymnast, “I always seem to be on during competitions so kind of used to it by now, so many competitions that close together, it was inevitable that I was going to be on [menses] for some of them” (G1). Or, athletes seek medical advice to prevent symptoms and/or bleeding using contraceptives/pain killers;

I generally do six weeks on the pill then one week off, I want to limit the amount of times it happens because I don't find it particular, it's not convenient and there's a lack of control because of those negatives and I want to perform at sport, I would rather limit the amount of time it [menses] happens.

(C4)

Athletes C5 and C6 all provided similar responses of, “I got used to it”, “I kind of manage it myself,” and “I just kind of

ignore it” but also displaying alternative feelings around, “it's annoying” and “inconvenient” while a weightlifter shared, “silently suffering” and “deal with it...it's no one else's problem, manage it anyway”

(W2).

Participants indicated a lack of proactive approaches and knowledge of ways to manage their menstrual cycle in relation to training and competition, with some athletes feeling like the options available are very limited; “I don't want to take pills, so there's not much I can do about it” (C8). Only one athlete (C6) reported alternative management strategies for competition; an increase in rest days was taken in the week prior to menses to help with feelings of tiredness and also diet was adjusted increasing iron intake the week prior, again to help her body best deal with menses if this coincided with competition. Otherwise, management strategies for training and competition were related to adjustment of training or seeking medical advice for pain killers or contraceptives. For example,

I used to get really bad cramps and I just couldn't do anything. But since I started taking Feminax that's stopped that. So I don't really suffer them as bad now because I take medicine for it. And if it happened on competition days, there was two competitions where I remember my period fell...if it's the day I come on, I literally, I couldn't function at all. But that's not the case now.

(J1)

Some athletes opted to take contraceptives to prevent any distraction, if they were managing menses in challenging environments, and wanting to control timing of withdraws bleeds, to have the convenience of no bleeds at all or to control fluctuation in weight for weight making-sports “because of the weight cut, being on contraception, there wasn't a change of increasing weight because I was due to come on [menses] I didn't have to worry about losing and gaining weight” (W6). However, many females felt they had received contradictive information from doctors or uncertainty in the advice provided on contraceptives, resulting in frustration and doubt about the use of contraceptives as a management strategy. One athlete commented, “no one even knows what half these contraceptives do and the impact on hormones, symptoms and long-term side effects” (A1). This view was supported by several other females and summarized by a climber:

I think especially when you're 17 you quite blindly just like, yeah that sounds great. But I do feel that definitely from doctors when I've gone you get quite like one sided response and they don't really acknowledge a lot of this sort of

side of stuff. I've seen doctors when I've talked about the different contraceptives that are available and I'm sometimes a bit disappointed with ... their lack of, it's not even really compassion, it's like, just accepting contraception is actually relatively new in the medical world, maybe there are long-term side effects.

(C3)

Multiple females reported conversations with doctors discussing symptoms/side effects they were experiencing, as a result of oral contraceptives, including feeling emotionally flat, headaches, or excessively emotional, and being disappointed or questioning responses they received. For instance, responses such as "it should settle down" which as one athlete reported, "3 months down the line and I'm still bleeding continually" (C2). There was also concern regarding the long-term use of contraceptives to control for factors associated with performance, as one climber testified:

Nobody has really said stop when I've gone for the check-ups and stuff and I've always asked is this causing me a problem? And I usually get a fudgy answer. "Is there a reason not to be on [contraception] for this long?" Nobody has really answered that, the guidance has been really poor when I think about it, I've just made my own decisions and I go on instinct.

(C4)

Other than from personal perception, female athletes use their support network, predominately peer conversations both in friendship groups and within sport to gain information from each other's previous experiences which has impacted on decisions regarding how to manage their menstrual cycle, especially relating to types of contraceptives and future choices which are made. Participant C2 discussed, "Yeah, because my friend had got it [implant] and she'd hadn't had nothing [no bleeding]. She'd had it for two years and she hadn't had any bleeding at all, and I was just like 'dream' not having a period at all would be so much better for climbing." As well as gaining information, peer conversations were also reassuring, "I have made really close friendships with who I would talk quite openly about it [menses]. How to manage it, which has been its refreshing to have someone else to talk about it [menses] with...it's just a way to realise that we all have the same issues" (C4).

Within peer conversations, menstrual products also appear to be widely discussed and offer different management strategies during menses. However, it was reported that information on menstrual products is not openly shared when females initially receive information and support when starting their menstrual cycle; the majority are provided with samples

of pads rather than awareness of different options available. Many females actively seek alternative options for training, competition, and performance in different environments. One athlete explained, "Maybe six months after starting [menarche] I started using tampons because I just thought that'll make a big difference in my sport if I can just, you know it's a lot easier. And it's a lot easier to forget that its going on if you've got one of them [tampon]" (C6). Meanwhile for climbing, the discovery of a menstrual cup has been useful;

You had to change things [menstrual pads and tampons] all the time. But I started using a menstrual cup for like a year now. And that's, you only change every 12 hours. It's great. Sometimes if you're at a crag (outcrop of rock) it would have been a bit of a pain but now it's much easier.

(C1)

Despite this, it can still be difficult to manage in some environments, with a climber highlighting "it was kind of tricky camping. I was like how would I feel taking this [menstrual cup] out, clean it well enough and be happy putting it back in when I'm camping and there's not even, I'm wild camping, there are no toilets or running water" (C1).

Monitoring/tracking have been reported as a useful strategy for some athletes to increase self-awareness of symptoms or identify within training if symptoms of the menstrual cycle negatively impacted upon training "I started [monitoring] after I stopped taking the pill because I didn't know if I was regular or know when I'm supposed to be on with weightlifting, it was really helpful to know if I am going to be on [menses] before a competition and stop freaking out about weight as I can look back and be like 'oh that's okay it was the same last month and the month before" (W4). Awareness of symptoms and impact on training and competition allowed for effective management strategies to be identified to benefit performance.

3.4 | Openness of conversations

Participants indicated that there was a lack of comfort or openness regarding talking about the menstrual cycle, as one athlete shared:

There is just like this culture around not talking about it [menstrual cycle] and I think it's so weird, it's so outdated, and is one of like the few areas where I think that there's a real kind of gender imbalance still...this culture around women just getting on with it kind of thing and

it's just strange that in 2019 we're not talking about things [menstrual cycle] like this.

(C7)

Participants explained that their openness and comfort regarding such conversations were influenced by their past experiences, particularly previous awkward conversations that may have occurred. A weightlifter described, "he's [partner] always a little bit repulsed by the idea [of periods], and you think well if he doesn't like the idea of talking about it then someone you're not as close to definitely doesn't want to hear about it!" (W2). Climbers similarly shared concerns regarding awkwardness and concern for others feelings, stating, "...if they're really awkward then it makes you feel more awkward" (C1), and "you don't want to make them feel uncomfortable" (C2), which resulted in them limiting conversations about the menstrual cycle.

Some participants indicated that they were more likely to have conversations about their menstrual cycle if it was impacting on their performance. For instance, a weightlifter explained, "if it was affecting me, I felt like it was affecting my performance, I would openly talk about it" (W4). However, in such instances, participants indicated that they may still be selective about who they shared this information with (eg, certain coaches they were more comfortable with; "I'd choose a person that wouldn't sort of say 'Oh God don't talk to me that's enough information'" W4). In contrast, other participants, such as one of the climbers, indicated that they would never discuss their menstrual cycle, even if it was affecting their performance, "God no! No! I don't think I would ever have had that conversation" (C2). When reflecting on why, she further explained:

I think that was the issue, being coached by men, because the guys I got coached by were quite old-fashioned...he had no comprehension of the female body and how it would be affecting them, I watched him tell girls off for being lazy when I knew that those girls were going through their periods, he just couldn't comprehend there was more to it than them just being lazy.

Similar thoughts were shared by a weightlifter who explained, "it's not something you really want to tell your coach, look I'm on my period today...I don't know, it's something about telling your male coach I'm on my period that you don't really if you cannot tell as many people as possible you try not to don't you" (W2). Many of the participating females suggested:

I think if you knew that male coaches were put in a room and just gave them a talk for an hour about look, this might be what your lifters are experiencing that they don't want to tell you. That would be helpful because then you don't

necessarily have to have the detailed conversations with them but say look this week it's going to be inconvenient.

(W2)

Instead comments of "I am not feeling 100% today" were used to cope during training.

In comparison, participants indicated a higher degree of comfort speaking to other females, even if they have not previously been coached or supported by the individual. As one weightlifter said, "I've been on trips with female coaches and obviously you can go and talk to her, like 100% comfortable saying I feel rubbish today because I'm on my period" (W2). However, this comfort was still not consistent across all participants, with a couple of females indicating a similar level of hesitancy speaking to female coaches. One athlete, coached by a female, shared "oh no, I wouldn't say anything...I just don't want to because it's awkward" (G1). However, all participants indicated that they would talk to the medical team, irrespective of whether it was a male or female doctor, because, as one participant explained, "that would be normal" (G1).

Aside from increased comfort of speaking to females, participants indicated that positive conversations, confidence, familiarity, and increasing age may also increase the openness or likelihood of conversations regarding their menstrual cycle occurring. For instance, a climber shared, "I think when I was younger it would have been awkward but now it's not so much...when I was younger I would never have talked about this but now we just don't really care" (C1), while another climber explained, "I think now when we're in a group where it's just the girls, we'll sit and complain about it...I think it's much more a thing we've got the confidence for it but I don't know if that would be the case with all the other girls, I think some people are quite reserved about it" (C2).

Additionally, participants explained that experiences such as talking to doctors about contraception, having smear tests, or having the coil inserted, increased their confidence to talk about their menstrual cycle and experiences more openly. Furthermore, participants' upbringing, specifically, the frequency and openness of conversations about the menstrual cycle as they were growing up appeared to influence subsequent conversations. As a climber explained, "I had a very open upbringing so I think I've always been quite not bothered about talking about those kind of things" (C6), whereas another climber conveyed limited conversations with family and peers and feelings of embarrassment discussing this topic and identifying, "only when I've got comfortable with myself that I've had the confidence to enter in to those conversations with people" (C4).

Overall, participants indicated that they would like to receive more knowledge on menstrual cycles in relation to sport, to increase their comfort discussing it and for this also

to be shared with coaches. For instance, one weightlifter shared, “It’s crazy because we’ve had loads of workshops about diet and nutrition and like psychology and S&C and stretching and meetings with physios but something that happens every month that you can’t control, there’s nothing” (W2). In fact, throughout the interviews, it was apparent that a number of participants were unaware of the potential impact their menstrual cycle might have, as a weightlifter explained, “I didn’t even know it could affect performance” (W2). With more knowledge and understanding, participants perceived they may talk more openly about this topic, which they felt would be beneficial. One athlete summed up the views of many stating:

I think it just needs to be spoken about more with everyone so it doesn't like it's not a taboo subject or people don't feel awkward about talking about things. People know where they can get advice from if they need to get advice or people just become a little more aware so I think just having more information out there and more opportunities to chat about it because information is thin and everyone is an individual and it completely depends on where you are and time in your life and what contraceptives you have. Like whether that's another athlete, a peer or support team member or whatever it is I think just avenues need to be opened up more. People don't want to say anything, don't want to be judged by it. But actually lots of people are in the same boat and we've been given the same bad advice.

(A1)

4 | DISCUSSION

The purpose of this study was twofold to examine (a) elite female athletes’ perceptions of the menstrual cycle on training and performance and (b) explore openness of conversation pertaining to the menstrual cycle with coaches and practitioners. The key intention was to engage with elite female athletes to understand their experiences and individual variability in response to the menstrual cycle alongside their comfort levels and experiences in having conversations with coaching and support staff. Overall, the findings of this study highlighted the extensive influence the menstrual cycle may have on training and competition performance in elite female athletes, the individual variability associated with this, and discrepancy in openness of conversation with female compared to male coaches and support staff.

Previous research has made us aware of data relating to the perceived impact of the menstrual cycle on sport performance;

Bruinvels et al⁷ identified 51.1% of elite British female runners and rowers felt their menstrual cycle had in some way impacted upon their training and performance, Martin et al²⁹ reported that 77% of elite athletes (n = 430), not using hormonal contraception, had negative side effects during their menstrual cycle and Findlay et al¹⁴ highlighted experiences of the menstrual cycle within elite rugby. However, there was a need to understand individual perceptions and which aspects of the menstrual cycle impacted on training and competition in individual and across multiple sports, as previous research has been predominantly large-scale survey-based approaches with minimal qualitative elements which allow individual responses to be addressed. This will help inform and influence best practice provided by coaches and practitioners.¹³ Also, notable is the timing of when these symptoms were experienced, and for some elite female athletes, the week prior to menses may have a greater impact in comparison with some who may experience heightened symptoms once menses start. Consistent with our findings, ratings of symptoms have increased during the premenstrual week and were maximal on the days immediately preceding and following the onset of menstruation.³⁰ It has been recognized the menstrual cycle causes recurrent, moderate-to-severe affective, physical, and behavioral symptoms that develop during the luteal phase and disappear within a few days of menstruation.³⁰

The current study has provided individual accounts of the perceived influence of the menstrual cycle on training and performance. The ability of elite athletes to train due to adverse symptoms was a prevalent feature; physical symptoms, including stomach cramps, lower back pain, or bloating were the predominant causes for training to be altered or missed. This is consistent with the results described by Kishali et al,¹³ in which it was determined pain affects performance, further supported by Findlay et al¹⁴ and Kin, Yegu & Illi³¹ reporting 70.87% of athletes indicated painful menstruation within their study. Psychological and affective symptoms also were reported in our study, with feelings of lethargy, decreased motivation and distraction being the most recurrent symptoms. These symptoms have been noted in both the general public and an elite athletic population.²⁹ These symptoms were recurrently experienced earlier than physical symptoms and were not always recognized by the individual to be related to their menstrual cycle, until the physical appearance of menses began when distraction also became a more prominent factor. It is possible that individual's mood does consistently rise and fall over the course of the menstrual cycle—but that the timing does not perfectly align across individuals³² providing a strength of the individual accounts provided.

Frequently, within our study, female athletes reported their symptoms had no impact on training, despite discussing adjusting or rearranging their training schedule as a consequence of symptoms experienced throughout the menstrual cycle. In some instances, self-awareness of the impact of the

menstrual cycle and acknowledgement it has upon training was limited. Ignorance or more limited self-awareness may be deemed to be beneficial by some participants, especially at competitions because it prevented them from expecting to feel tired or not performing at their best at certain times in their cycle. Lack of awareness of these symptoms and feelings could reduce the impact it has on competition, preventing anxiety and worry of underperforming in elite athletes. However, having a self-awareness of the menstrual cycle may help preparation and management of any negative symptoms. Alongside this, factors such as making weight, in which awareness of weight gain in relation to the menstrual cycle may reduce stress and anxiety at competition was frequently reported.

Several of the interviewed athletes within the current study reported worse premenstrual symptoms when they were a teenager, reduced awareness, and also lower confidence to have open conversations, highlighting the importance of providing information and promoting self-awareness to youth athletes improving management of premenstrual symptoms and menses. Therefore, there are both consequences and benefits of increasing self-awareness of the menstrual cycle for females in elite sport. Monitoring of symptoms and cycle length could be one strategy to increase self-awareness of the menstrual cycle, but the potential for some athletes to become increasingly anxious, especially at competition, as a result of being more aware of their menstrual cycle should be considered. It may be important to identify management strategies in alignment with monitoring of symptoms to prevent this.

Having insight into individual variation in symptoms and perceived impact can increase the understanding and inform best practice for coaches and practitioners working within elite sport. A key aspect of the findings illustrates that one approach cannot be applied to all female athletes, whether this is for symptoms and management, training, competition, or increasing comfort and openness of conversations. For example, only one athlete reported feeling increased muscle soreness and taking longer to recover prior to menses, consistent with research by Hackney, Kallman & Aggon³³ evidencing female sex hormone changes due to the menstrual cycle can affect the physiological responses during the recovery period. For this individual, an increased focus on recovery may be pertinent, ensuring training is adapted accordingly. Identifying and understanding experiences of the individual elite female athlete regarding her menstrual cycle symptoms and responses is key for coaches and practitioners to optimize performance through evidence informed practice.

Previous research has been contrasting in relation to the physiological impact of the menstrual cycle on sport performance and adaptation, and however, as established from the current results, this may be due to the individual variability in timing of and symptoms experienced by each individual. The influence of psychological determinants such as motivation

and levels of lethargy should also be considered throughout the cycle in relation to performance, as stated by multiple female athletes within this study; this has not previously been considered within the literature yet we know the impact of motivation on performance, those athletes who display high motivational profiles have been shown to obtain the highest levels of performance.³⁴

Psychological determinants also commonly refer to changes in mood, but similarly to the previously reported studies, most studies have presented averaged reports of mood across days that fall into a defined phase. However, given that healthy individuals exhibit considerable variability in cycle length, day of ovulation, and hormonal patterns,³⁵ it is unlikely that these set phases capture the same biological phenomenon across individuals. Instead, it is important to identify individual differences, as previously reported, to account for up to 16% of variance in mood symptoms.³² Other researchers have similarly found that individual patterns of change across the menstrual cycle are more reliable in predicting significant discrepancies than attempts to fit people to an “average” pattern of change.³⁶ Within our study, unlike physical symptoms, not all females reported affective and psychological symptoms. Some individuals reported changes in mood across different time frames and severity was also variable. For instance, one female shared “one month one thing will happen, the next month something else will happen.” Therefore, these symptoms are not only variable between individuals but also within the same individual month to month. Comments including “rather watch TV and eat chocolate” rather than go training highlight mood and motivational changes experienced in elite female athletes.

One consistently reported element was the distraction of leaking or blood showing through clothes especially at competition, which was consistent across all sports, irrespective of competition clothing which ranged from singlets, leotards, shorts, and a white gi. This aligns with previous findings in which the trauma of staining clothing or leaking through underwear was deemed the most embarrassing event that could happen while menstruating.^{4,14} This is an element which should be addressed within sport, providing athletes advice on menstrual products available and consideration of clothes females are required to wear for competition.

Coping strategies utilized by the participants in the current study were predominately limited to contraceptives or analgesic and anti-inflammatory medication to adapt and manage symptoms impacting on training and performance otherwise an acceptance “get on with it” approach was observed. Most reported coping strategies were used to control the timing of menstruation, to be able to control this in relation to competition performances, to prevent the onset of symptoms or the inconvenience of bleeding and associated anxiety or distraction of leaking while performing. This was consistent except for climbers in which controlling the menstrual cycle

was more useful when in locations without any toilet facilities and concerns of poor hygiene. Despite perception of limited options “I don't want to take pills, so there is not much I can do,” other management strategies are available. O'Brien et al¹⁰ highlighted non-drug-based treatments including education, relaxation techniques, regular aerobic exercise, and nutritional supplements. Within the present study, individual athletes discussed some additional coping strategies such as use of heat for pain management, only one athlete highlighted increasing rest pre-competition if this coincided with premenstrual symptoms of decreased energy levels and increased lethargy to optimize performance. This may be related to a heightened self-awareness. Elite female athlete education on coping strategies is recommended to help reduce symptoms and impact on training and performance, this coincides with one athlete sharing she had received “loads of workshops about diet and nutrition and like psychology and S&C and stretching and meetings with physios but something that happens every month that you can't control, there's nothing”. Currently, there is often a lack of support for many elite female athletes in relation to their menstrual cycle compared to other areas of sport science which requires attention due to the impact on health, well-being, and performance.

The current findings provide some intriguing insights into individual and group factors that relate to the openness of conversation about the menstrual cycle. Many athletes indicated an openness to talk about the menstrual cycle to female support staff, however, great variation in the comfort athletes felt regarding talking to male coaches irrespective of duration of the relationship between the coach and athlete was evident. This is consistent with recent findings in female team sport, many athletes referred to staff gender when considering who they would feel comfortable approaching in relation to menstrual cycle issues. It was acknowledged that previously, female staff members had approached athletes and initiated discussions on menstrual cycle management prior to a major event, and having a female doctor reduced the unease surrounding the subject.¹⁴ Others noted the unease at having menstrual cycle conversations with male support staff.¹⁴ Also, female athletes in the current study shared the opinion of an outdated culture not talking about the menstrual cycle and questioning the reasoning for this. Perceptions were displayed that males “don't get it” or are awkward talking about the menstrual cycle. This is supported by previous research highlighting male coaches, compared to female coaches reported it was less important to ask athletes about menstrual irregularity, being less comfortable communicating with female athletes about the topic.¹⁸ However, within this research “high knowledge coaches” in relation to the menstrual cycle were more likely than “low knowledge coaches” to discuss the female athlete triad irrespective of gender.¹⁸ Despite the current study not investigating coaching perceptions of openness of conversation, as this was beyond the scope of

the study, the current results in combination with previous research highlight future support are required to change perceptions to improve conversations held about the menstrual cycle in relation to sport performance. This could be essential in sport as the IOC has released figures that at Rio Olympics 11% of accredited coaches were female yet in 2020 it is estimated that 48.8% of athletes will be female.³⁷

There is a need to action and increase the conversations of elite female athletes talking to male coaches or practitioners about the impact their menstrual cycle can have on training and competition performance. This is pertinent as research highlights that coaches are in a strong position to support their athletes' development if they know them well.³⁸ Jowett³⁹ states that communication is an important unifying relational component; a key factor to successful outcomes in coaching. Communication promotes the development of shared knowledge and understanding about various issues (eg goals, beliefs, opinions, values) and forms the basis for initiating, maintaining, and terminating the coach-athlete relationship.⁴⁰ Open channels of communication enable the majority of the coach-athlete relationships examined to establish co-oriented views as shared knowledge and understanding.³⁸ Understanding each other's position leads to effective interactions in both training and competition.³⁸ Open communication pertaining to the menstrual cycle, sharing knowledge and understanding, may be an important aspect to enhance athlete-coach relationships and impact on performance. Furthermore, if menstruation was discussed more openly, it might be easier for girls and women to acknowledge the positive aspects and understand the physiology to positively impact training and performance.

Improving both athlete and coach knowledge and providing education on the menstrual cycle, correct terminology, constructing positive conversations, and changing the perception of awkwardness could significantly reduce the discomfort and outdated nature of not having conversations relating to the menstrual cycle. Irrespective of coach knowledge, within the current study, female athletes perceived comfort of conversation would improve if coaches received education about the menstrual cycle. Improving coach knowledge of the menstrual cycle, how to have positive conversations and insight into what individual female athletes may be experiencing was raised as a factor within individual interviews to help improve the openness and comfort of having conversations pertaining to the menstrual cycle. Teaching basic facts about the menstrual cycle is a chance to correct misconceptions and misinformation learned, and show the power of culture and social cognition on something as basic as a physiological process.² This may contribute to improving male coaches' ability to respond on a more individual basis to their athletes along the lines of gender,¹⁹ overcoming male coaches adjusting their practices to the detriment of their female athletes based upon erroneous and unequal ideas of females as performers.²⁰

Previous experiences and perceptions of male awkwardness or lack of knowledge reduced the comfort of female athletes speaking openly and sharing experiences with male coaches and practitioners; a determinant which needs to be resolved. Research has stated educational materials for coaches should provide strategies for male coaches to comfortably and sensitively address issues relating to menstrual health among their female athletes. Indeed, Kroshus et al¹⁸ reported that coaches wanted to learn more about health issues relevant to female athletes, including sports nutrition (88%), strength training and female athletes (72%), and menstrual function.

4.1 | Applied implications and future research direction

The current findings detailing the perception and openness of conversation relating to the menstrual cycle offer potentially important and previously unreported contributions to the literature. In addition, our discussions with participants regarding information they would find useful to know in relation to the menstrual cycle and sports performance can provide applied implications to provide future direction and best practice for female athletes. As highlighted in the results, information requested from elite athletes within our study can be grouped into five key areas: (a) contraceptives including side effects, long-term health impact and effect on training; (b) menstrual products; what options are there and any products which are preferential for different sports; (c) how the menstrual cycle can affect training and competition and management strategies for these; (d) coach education, improving awareness and understanding; and (e) information for youth athletes and opportunities/advice of who to talk to. Monitoring of the menstrual cycle may be advisable to elite female athletes to increase self-awareness and better understand symptoms which are related to the menstrual cycle which may lead to identifying positive management strategies. Continued education and workshops for athletes, coaches and support staff are warranted to increase awareness of symptoms and strategies and may positively contribute to optimizing training and performance of female athletes, ensuring an ongoing process and not just a one-off talk.⁴ This may be particularly important for younger females who may not be managing their menstrual cycle effectively. Research has stated females have identified the internet as an important educational source when it came to menstruation and should be a consideration for further education for elite female athletes.⁴ Alongside being used to find out about the menstrual cycle and alternative menstrual products, the internet has been used as a platform for monitoring symptoms and attempting to challenge traditional norms about menstruation.⁴ This requires further investigation and whether this is the best approach for coaches and elite female athletes.

The above recommendations could enhance elite female athlete support and enhance long-term health, well-being, and performance alongside providing direction for future research areas. In the first instance, increasing the openness and comfort of conversation about the menstrual cycle should be a priority for athletes, coaches, and practitioners. This research should also be expanded to other populations, extending geographical, and cultural insight including the interaction of gender role and identity as this was beyond the scope of the current paper.

4.2 | Limitations

Limitations of the study should be considered, for the first aim of the study, all athletes were elite/senior level and did not capture perception and experiences of junior athletes which may vary in symptoms, impact on training and performance and comfort of conversations. A large proportion of the sample were climbers, which is not representative of more popular, traditional female sports (eg, swimming, tennis, netball). However, despite this, the results were consistent across sports in most regards excluding the outside environment of climbing and aligned with findings reported by Findlay et al¹⁴ in female rugby players. Only one interview was completed with each individual, additional interviews may have increased comfort of conversations for some individuals and enhanced the depth of discussion collected. In some instances, it was the first time the female had openly discussed their menstrual cycle, this may have influenced the quality of information collected alongside the different times of the menstrual cycle when interviews were completed which may have provided different responses due to recall error and symptoms being experienced at the time of interview. Relating to the second aim of openness of conversation, there may be a bias in the sample in which athletes who were interviewed participated because they were comfortable talking openly about the menstrual cycle and may miss the perceptions of those that remain uncomfortable being involved in these conversations. A questionnaire associated with discomfort and openness of conversation pertaining to the menstrual cycle may better address this question. In conjunction, coaches' perceptions of comfort of conversation were not collected within this study, which may influence communication between the coach and athlete. However, as females perceived an awkwardness of male coaches in conversation, these perceptions should be considered in addition to the other factors identified influencing conversation (age, previous conversations, experience, and familiarity with the person). It may be important for coaches to be aware of the perceptions and other influencing factors when approaching the conversation about the menstrual cycle with elite female athletes. Future research should be completed within this area

to identify perceptions and experiences of coaches talking to females athletes about the menstrual cycle when considering training and performance.

5 | CONCLUSION

In summary, it is important to change any negative perceptions as the menstrual cycle is a normal bodily function and physiological process which can impact on training and performance due to the high prevalence of symptoms experienced. Elite female athletes' experiences varied greatly between individuals, however, many reported physical symptoms as well as mood disturbances and reduced motivation to train. They sometimes sought to minimize training intensity and load. The decision to actively control their menstrual cycle was often triggered by a desire to reduce the effect on competition, particularly given that athletes were anxious about making their required weight in some sports or distraction of leaking and blood showing through clothes. Athletes indicated an openness to talk about the menstrual cycle to female support staff, however, there was great variation in the comfort athletes felt regarding talking to male coaches. This was independent to the duration of the athlete and coach relationship and in some instances linking to uncomfortable conversations experienced at a younger age in school or sport. From an early age, females receive messages to hide their periods and this is a perception that requires change in order to allow the positive aspects of menstruation to be identified and openly talk to maximize sport performance. Considering how to promote an environment of open discussion and establishing procedures for elite female athletes to identify known points of contact are important to increase the opportunity to talk about the menstrual cycle and impact on health, training, and performance.

6 | PERSPECTIVE

Females are exposed to messages from a young age to hide their menstrual cycle, reinforced by media forms using allegorical images to promote secrecy. As a result, the confidence and comfort of females having conversations in relation to the menstrual cycle is affected. Our results highlight elite female athletes experience physical, affective, and psychological symptoms before and during menses which impact upon the ability to complete training sessions, either adjusting or rearranging them. This is alongside increased anxiety and distraction while at competition affecting performance. The menstrual cycle is a biological process, impacted by health and well-being and having the ability to both positively and negatively impact on performance. Therefore, it should be considered equally and

discussed when necessary alongside other performance determinants in sport, with the absence of feelings of embarrassment or awkwardness during the conversations.

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APPENDIX

Interview guides

Female Athlete—natural cycle (non-contraceptive)

Before beginning, I want to make you aware our conversation is going to be recorded, it will be kept confidential, but it helps me as I will struggle to remember everything you tell me today and will be helpful to refer back to. You can stop the recording or conversation at any point and shouldn't feel any pressure to answer any questions, if you don't want to answer that is absolutely no problem. There are also no right or wrong answers, I am just interested in your personal experiences relating to the menstrual cycle. We will talk through how you feel about your menstrual cycle, in relation to daily life, training and competition.

Do you have any questions before we start, and I will turn on the recorder?

To start a bit of background about you and your sport;

- What age are you and what sport do you currently compete in? Have you always competed in that sport?
- How is training and your competitions going at the moment?
- What have been your recent highlights of competing?
- What are your main goals/targets for 2019?
- Thinking about when you started having your period, what was that like for you?
 - a. How old were you?
 - b. Were you already playing sport then?
 - c. Do you remember it having any impact on your sporting participation?
 - d. Was there anyone you turned to for advice or information at this time? What advice did you get?
- As you've got older, has your menstrual cycle remained relatively similar and regular or have you experienced changes?
 - a. If changes have happened, what has this been? (eg, irregular period, different symptoms)
 - b. Do you have any idea why?
 - c. What impact have these changes had on you as an athlete?
- Currently, what is your experience of your period like?
 - a. How does it make you feel (mentally, physically, emotionally)?
 - b. Do you experience any discomfort or symptoms at the different phases of your cycle? (before, during or after menstruation?) If so, can you describe these? (eg, cramps, headache, mood?). If it helps when I talk about symptoms these are the things I am referring too (PROVIDE LIST OF SYMPTOMS). How do you manage these symptoms?
 - c. Do you consider yourself to have heavy periods? How do you find using sanitary products with training and

competition? Do you ever need to use double sanitary protection? Do you have to change the product frequently? Do you feel that this impacts on your daily life, training and/or competition performance?

- As an athlete, how do you think about your menstrual cycle and training?
 - a. Does it impact on training?
 - b. How do you manage it?
 - c. How have you determined how your menstrual cycle affects this? Have you/do you record your training and menstrual cycle throughout the month? Is yes, how do you complete this? Do you share this information with anyone else?
- How do you think about your menstrual cycle in relation to competitions?
 - a. Does it impact on competitions?
 - b. How do you manage it?
- As a female athlete, have you ever had any support or advice relating to your menstrual cycle?
 - a. From whom?
 - b. What advice?

What information would you like about menstrual cycles? What guidance or support would be useful for you as an athlete to discuss this further? From who?

How do you feel having conversations about your menstrual cycle?

- a. Today?
- b. With your coach, support staff, peers?
- c. Do you discuss your menstrual cycle with your coach or consider this in your training or competitions preparation? How does your coach respond?
- d. Do you feel it relevant to talk to your coach about your menstrual cycle?/Why do you not discuss this with your coach? (Not relevant/haven't thought about it/uncomfortable conversation?)

I am just going to double check we have covered everything today.

Thank you, those are all my questions for now, but is there anything else you would like to share or add about your experience of menstrual cycle, training and performance?

The conversation is now finished, and I will stop recording. Thank you for taking the time I really appreciate it.

Female Athlete—contraceptive user

Before beginning, I want to make you aware our conversation is going to be recorded, it will be kept confidential, but it helps me as I will struggle to remember everything you tell me today and will be helpful to refer back to. You can stop the recording or conversation at any point and shouldn't feel any pressure to answer any questions, if you don't want to

answer that is absolutely no problem. There are also no right or wrong answers, I am just interested in your personal experiences relating to the menstrual cycle. We will talk through how you feel about your menstrual cycle, in relation to daily life, training and competition.

Do you have any questions before we start, and I will turn on the recorder? Do you have any questions before we start, and I will turn on the recorder?

To start, a bit of background about you and your sport

- What age are you and what sport do you currently compete in? Have you always competed in that sport?
- How is training and your competitions going at the moment?
- What have been your recent highlights of competing?
- What are your main goals/targets for 2019?
- Thinking about when you started having your period, what was that like for you?
 - a. How old were you?
 - b. Were you already playing sport then?
 - c. Do you remember it having any impact on your sporting participation?
 - d. Was there anyone you turned to for advice or information at this time? What advice did you get?
 - e. Did you experience any symptoms or discomfort (cramps, headache, change in mood)?
 - f. Did you consider yourself to have heavy periods? How did you find using sanitary products with training and competition? Did this impact daily life, training or competition?
- You have shared that you take contraceptives
 - a. Do you experience withdraw bleeds and are these regular? Does any irregularity affect daily life, training or competition?
 - b. What was your reasoning for taking contraceptives, was this related to sport?
 - c. What impacted your decision as to which form of contraception to take? Did you receive any advice or information about this? Discuss it with anyone?

d. Do you experience any symptoms, if it helps when I talk about symptoms these are the things I am referring too (PROVIDE LIST OF SYMPTOMS) How did you manage these symptoms?

- As an athlete, what are your thoughts about having a period during training?
- As an athlete, what are your thoughts about having a period during competition?
 - a. How do you manage your withdraw bleeds at competition? Does it affect your performance?
- As a female athlete, have you ever had any support or advice relating to your menstrual cycle?
 - a. From whom?
 - b. What advice?

What information would you like about menstrual cycles?

What guidance or support would be useful for you as an athlete to discuss this further? Who from?

How do you feel having conversations about your menstrual cycle?

- a. Today?
- b. With your coach, support staff, peers?
- c. Do you discuss your menstrual cycle with your coach, regarding taking contraceptives? Do you consider how taking contraceptives may interact with training and performance?
- d. Do you feel it relevant to talk to your coach about your menstrual cycle? If yes, why. If no, why?

I am just going to double check we have covered everything today.

Thank you, those are all my questions for now, but is there anything else you would like to share or add about your experience of menstrual cycle, training and performance?

The conversation is now finished, and I will stop recording. Thank you for taking the time I really appreciate it.