



Perceptions of menstrual cycle tracking among elite rugby players

Alice Verrier, Camilla J. Knight & Natalie Brown

To cite this article: Alice Verrier, Camilla J. Knight & Natalie Brown (2024) Perceptions of menstrual cycle tracking among elite rugby players, *Journal of Sports Sciences*, 42:16, 1538-1547, DOI: [10.1080/02640414.2024.2400810](https://doi.org/10.1080/02640414.2024.2400810)

To link to this article: <https://doi.org/10.1080/02640414.2024.2400810>



© 2024 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group.



Published online: 13 Sep 2024.



Submit your article to this journal



Article views: 660



View related articles



View Crossmark data

Perceptions of menstrual cycle tracking among elite rugby players

Alice Verrier^a, Camilla J. Knight^{ab,c} and Natalie Brown^{a,c}

^aDepartment of Sport and Exercise Sciences, Swansea University, Swansea, Wales, UK; ^bDepartment of Physical Education and Sport Science, University of Agder, Kristiansand, Norway; ^cWelsh Institute of Performance Science, Wales, UK

ABSTRACT

The purpose of the current study was to understand female rugby players' perceptions of menstrual cycle (MC) tracking and identify the impact of MC tracking for the players. Interpretive descriptive methodology was adopted. Interviews were conducted with 12 elite female rugby players (age 25.2 ± 4.3 years), who were all naturally menstruating. Data were analysed following the four stages recommended within Interpretive Description. Results identified that athletes obtain personal benefits from MC tracking by; enhancing understanding of their MC and symptoms, and responding to their MC and symptoms. Athletes also reported that the process of tracking their MC enhanced relationships by; improving communication and interactions with coaches and support staff, and by facilitating team support. Specifically, using tracking increased the opportunities for open conversations with coaches, support staff and teammates regarding their MC. Overall, the findings highlight benefits of menstrual cycle tracking within this group of naturally menstruating rugby players, particularly in helping players and coaches understand the individual nature of the MC, engage in conversations, and establish support from teammates.

ARTICLE HISTORY

Received 14 December 2023
Accepted 29 August 2024

KEYWORDS

Elite sport; females; menstrual cycle; perceptions; tracking apps

Women's sport has increased in participation, exposure, and professionalism due to the heightened discourse and action of women's leadership, equal pay, safeguarding coverage, and participation (Bowes et al., 2022). Accompanying this should be specific support for female athletes, that varies from male athletes, due to marked differences between the sexes from a physical and performance perspective (Quarrie et al., 1995). However, almost one in three elite female athletes report having never received any female health-related information, despite being a cohort of predominantly professional athletes with access to a range of embedded healthcare professionals (Heather et al., 2021).

One area of female health in which research and subsequently the dissemination of information to athletes is pertinent, is related to the menstrual cycle (MC). Specifically, the fluctuating hormone levels of oestrogen and progesterone, which are known to affect cardiovascular, thermoregulatory, respiratory, metabolic parameters (Julian et al., 2017), and force production (M. J. Smith et al., 2002). Research has found that the MC may impact rapid force production as oestrogen has a neuroexcitatory effect and progesterone inhibits cortical excitability (Gordon et al., 2013; M. J. Smith et al., 2002). This may influence performance as female athlete's muscle activation may be reduced, in particular the initial motor unit firing rate which is a main determinant of the rapid force production required to perform explosive movements (del Vecchio et al., 2019; M. J. Smith et al., 2002).

Alongside physiological changes, the MC can potentially influence a variety of other parameters and consequently performance. For instance, O'Brien et al. (2011) discovered that

psychological and behavioural symptoms associated with the MC can include lethargy, fatigue, poor concentration, and coordination; all factors which may impact sport performance. Meanwhile, within rugby, Findlay et al. (2020) reported 67% of elite female rugby players considered their MC symptoms and hormone fluctuations to be performance impairing.

Given such insights, it is now widely recognised that there is a need to expand knowledge and understanding of the MC among athletes, coaches, and practitioners and particularly seek to influence best practices and optimise support provided by coaches and medical staff to resolve issues relating to well-being, health, and sporting performance (Kishali et al., 2006). This was outlined in a recent review exploring sport science and sports medicine in women's rugby, although also outlining female health as a high-priority research theme to provide clear direction and guidance (Heyward, Emmonds, et al., 2022).

However, for research to be embedded into practice, we need to establish an open environment in which the MC is discussed in confidence alongside other physiological factors within sport performance (Bruinvelds et al., 2016) to allow this to be applied in practice. In fact, evidence suggests that there is still a lack of communication about the MC, with it being seen as a "taboo" subject (Brown et al., 2021). Moreover, within team sports setting, coaches often address the topic of MC at a group or team level, limiting the number of one-to-one conversations with athletes (Shanmugam & Jowett, 2016). This may result in a lack of opportunity for female athletes to engage in an effective conversation with their coaches, particularly males (Findlay et al., 2020). However, Findlay et al. (2020) emphasised the need for coaches/medical staff to initiate conversations

CONTACT Camilla J. Knight  c.j.knight@swansea.ac.uk  Department of Sport and Exercise Sciences, Swansea University, A103 Engineering East, Swansea University Bay Campus, Fabien Way, Crymlyn, Burrows, Swansea SA1 8EN

© 2024 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group.

This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0/>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited. The terms on which this article has been published allow the posting of the Accepted Manuscript in a repository by the author(s) or with their consent.

with female athletes and to "normalise" conversations regarding the "taboo" subject. Normalising the conversation is necessary to increase confidence of female players to openly report menstrual related issues such as severe symptoms, or absent/irregular periods as these may have a negative consequence for both the health and performance of the player which can be addressed through appropriate coach and medical support.

MC tracking could provide a platform to improve openness of conversation between athletes, coaches and support staff, via a culturally appropriate approach, while also supporting athletes and coaches to more fully understand the individual responses and associated impacts of the MC on sport performance (McNulty et al., 2020). MC tracking applications (apps) have recently become prominent, allowing athletes to track their cycles and predict their menstruation dates (Worsfold et al., 2021). In elite sports, the use of tracking the MC has become widespread, with data suggesting that over half of elite sportswomen may be tracking their MC (Heather et al., 2021). MC tracking apps enable athletes to record when menstruation occurs and any associated physiological and psychological symptoms that may occur through their cycle. Subsequently, individual strategies can be implemented to address recorded symptoms, including for instance, modifying athletes' sleep habits, training, diet, or lifestyles which in some instances can be provided by the app. Evidence from beyond sport (e.g., Li et al., 2020), as well as within sport settings (e.g., Heather et al., 2021) has suggested that MC tracking can be useful for allowing individuals to gain a better understanding of menstruation and the MC more broadly.

Within rugby codes, only 22% of practitioners have reported MC phases being monitored (Heyward et al., 2020). However, within and beyond rugby, to-date, limited consideration has been given to elite athletes' perceptions of engaging in MC tracking. If MC tracking is to be suggested as a beneficial approach to understanding and facilitating discussions regarding the MC, such insights are needed. Furthermore, understanding athletes' perceptions of MC tracking is necessary to ensure that practitioners utilising or considering using tracking approaches can ensure they meet the needs of athletes, which would subsequently enhance engagement and any associated benefits. To this end, the aim of this study was to understand female rugby players' perceptions of MC tracking and identify the impact the process of tracking has upon them. Specifically, this study sought to answer two questions: 1) What are players' experiences and perceptions of the MC tracking process? and, 2) What is the perceived impact of tracking on player's wellbeing and performance?

Method

Philosophical underpinnings and methodology

To address the aims of this study and facilitate an in-depth understanding of elite female athletes' perceptions of MC tracking, an Interpretive Descriptive (Thorne, 2016) methodology was adopted. Interpretive description is particularly beneficial for conducting research with an emphasis on producing applied implications (Thorne, 2016). Given the aim of this study was to generate applied data to use in the sporting

environment to benefit athletes' and staff's understanding of MC and tracking, this was deemed valuable. This work was approached from a constructivist paradigm, recognising the constructed and contextual nature of human experience was acknowledged and we sought to develop an understanding of the multiple and shared realities of individuals (Thorne et al., 1997).

Participants and sampling

Participants were purposefully sampled (Thorne, 2016) based on (a) sex (biologically menstruating females), (b) aged 18 years and older, (c) able to communicate in English, (d) member of a National Women's Rugby Team who were had been using MC tracking for at least six months, (e) participating in MC tracking and were naturally menstruating (Elliot-Sale et al., 2021). These criteria were selected to ensure participants were "information-rich" (Patton, 2023) and thus had sufficient insights regarding MC tracking in sport. In total, 12 elite female rugby union players (age 25.2 ± 4.3 years) took part. All were competing on the international stage and were using the team MC tracking app.

Following receipt of ethical approval from Swansea University [6567], participant recruitment began. Specifically, the lead researcher contacted a National Rugby Team to gain their interest in the study. Following agreement from the coaching team, information pertaining to the study was sent to individuals who met the criteria. Interested players contacted the lead researcher to arrange an interview if they wanted to participate.

Data collection

Data were collected through individual semi-structured interviews, with each participant completing one interview. Interviews were selected because they are useful for exploring participants' experiences and perceptions (which was the focus of the current study) in detail (Knott et al., 2022). Particularly, semi-structured interviews enable a researcher to both utilise a pre-planned interview guide, ensuring that the topics of interest to them are covered, while also making use of open-ended questions, which enable the participant to share detailed answers and steer elements of the subsequent questioning (B. Smith & Sparkes, 2016).

The interview guide was developed following the guidance of Rubin and Rubin (2012). Specifically, starting with introductory questions to ease participants into the interview, before transitioning to the main focus of the study. The interview guide was developed in collaboration between members of the research team, drawing on a range of literature pertaining to menstrual cycles (e.g., Brown et al., 2021; Findlay et al., 2020) as well as the experiences of the research team who were, respectively, working as an intern in a women's rugby team, a consultant in rugby and qualitative researcher, and an expert in women's health/menstruation and sport. Additionally, a pilot interview was conducted with an individual who was not part of the rugby team. The pilot interview was conducted to enable the interviewer to practice their interview technique and ensure the questions

asked would elicit pertinent information. No changes to the broad interview schedule were made because of the pilot interviews, however additional prompts were included to facilitate more in-depth response.

Prior to the start of each interview, which were conducted via Zoom, a written and verbal explanation of the study was provided, and participants were given the opportunity to ask questions. Informed consent was obtained both verbally and in written form prior to the interviews beginning. The interviews then began with introductory questions, which sought to identify demographic information such as participants' rugby experiences and what they most liked and disliked about playing rugby. Participants were then asked transition questions regarding their perception of female participation in sport, the changing perceptions regarding female sport and female sport science. Subsequently, the interview moved onto the main questions. These were focused on participants' perception of the process of daily monitoring of their cycle and the associated impact on their training and performance. The interview concluded with summary questions, specifically focused on how the participants felt about tracking their MC in a performance setting. In total 12 interviews were completed, which ranged in length from 39–66 minutes.

Data analysis

Using an inductive analytical approach, which is a characteristic of interpretive description (Thorne, 2016), the lead researcher studied the participants' perceptions of MC tracking to identify characteristics, patterns, and structures participants highlighted regarding MC tracking perceptions and performance. The process began through the initial review of auto-created transcripts produced by the Zoom recording system. Transcripts were checked for accuracy and personal information was removed. The first author then read and re-read the transcripts to ensure immersion in the data. Next, each transcript was examined in line with sequential cognitive processing, as recommended by Thorne (2016). Specifically, during the reading and re-reading of the transcripts the lead researcher was focused on comprehending the data. That is, she sought to gain an understanding of everything provided in the transcripts from the perspective of the participants. Next, the focus was on synthesising, where the transcripts were examined to identify information that was related to the study purpose; seeking to identify potential codes and themes that may answer the research question. Theorising subsequently occurred, whereby the themes that had been generated were reviewed and placed into an organisational structure. Finally, the data were reconceptualised into the written results presented in the paper.

Methodological rigour

Within qualitative research it is recognised that the rigour or quality of qualitative studies should be considered in line with the specific methodology used (Sparks & Smith, 2009). That is, rather than using one set of quality criteria that is applied to all qualitative studies, it is suggested that one should use approaches that fit with the methodological approach adopted. As such, given that this study was conducted using an Interpretive Descriptive methodology, Thorne's (2016) recommendations for enhancing credibility informed this study. Specifically, with regards to representative credibility, we explicitly sought individuals who were engaged with the phenomena of interest, ensuring to include individuals with a variety of experiences and perceptions relating to MC tracking, as well as varied symptoms related to their MC, different amounts of time spent in the setting, and perceptions of female sport and physiology. Analytical logic was followed through a comprehensive analysis approach, detailed in the methodology and subsequently illuminated through the results. Additionally, there was engagement with critical friends (Smith & McGannon, 2017) throughout the analysis process, in which other members of the research team questioned the developing themes and pushed the lead author for detailed explanations of how she had established the themes. Finally, interpretive authority was assured through the lead author working for several months in the setting as an intern, which enhanced her understanding of the MC tracking process. Additionally, the other members of the research team having expertise in this field of research and working directly within rugby settings for several years, enabling them to critique and question the developing ideas.

Results

The purpose of the current study was to understand female rugby players' perceptions of MC tracking and identify the impact the process of tracking has upon them. In seeking to address this purpose, participants were asked to comment on their experiences of MC tracking. However, through the interviews, it became apparent that the participants' experiences of tracking were mainly limited to engagement with a specific MC tracking app that was being used by their team. As such, although participants were asked to comment on tracking in general, the results refer to specific elements associated with the app (for instance access to nutrition information).

Analysis of the data lead to the identification of two overarching themes; a) Personal benefits of MC tracking, and b) Enhanced relationships. Each of these themes comprised two sub-themes (see Table 1).

Table 1. Overarching theme and sub-themes of the results.

Overarching Theme	Sub-Themes
Personal Benefits	(1) Enhanced understanding of the menstrual cycle and symptoms (2) Responding to the menstrual cycle and symptoms
Enhanced Relationships	(1) Improving communication and interactions with coaches and support staff (2) Shared experiences with teammates



Personal benefits of MC tracking

Personal benefits were reported by all participants, this related to the specific insights they gained from tracking their MC. Specifically, this theme contains data relating to how tracking enhanced individual understanding and knowledge of the MC, and subsequently player's ability to manage their own MC.

Enhanced understanding of the menstrual cycle and symptoms

Through tracking their MC using an app, participants had enhanced their understanding of their MC. For instance, Participants 1 and 3 agreed they noticed "some patterns in terms of different stages of my menstrual cycle". Meanwhile, Participant 4 liked having "knowledge and understanding" of her own body because of MC tracking. Participant 12 explained:

"[S & C coach] has gone through my cycles a couple of times and I kind of know now. Like the week before is when I'll be my strongest and the week two is when I'm weakest. So, when you kind of know when to really push in the gym and when to kind of hold off a bit. And even just like when I'm in like, you know, like week one with my period, I know that I'll push as much as I can push, but like I kind of give myself a bit of a break as well. Yeah. So, I guess the tracking, gives me a better understanding of my body and also, you know, knowing that I can't push as much sometimes."

Although for many of the participants, tracking their cycle had increased their knowledge of their MC for others, they found tracking their cycle and particularly recording it on an app to be helpful because they felt they did not yet fully understand their cycle. Particularly, those participants indicated that tracking their cycle and subsequently being able to be guided by the information on the app was useful:

"Whereas before [I started tracking] my partner used to know a few days before when I was coming on due to my mood swings and how I was tired all the time. Um, so I think now we are more aware of. Like potentially what phase you're in and where you can push like where you're oestrogen and progesterone levels are different. Yeah, yeah, yeah. Where they're at in stages. So, knowing if you can push harder. Maybe look for PBS in the gym and things like that. So, I do check the app regular to see where I'm at. Yeah. Um, I'm not quite savvy enough to know myself yet, but I try to keep checking and monitoring this so I can try and work it out. (Participant 6)"

Overall, as indicated in the quotes above, as participants started to access information about their MC, they became more aware of the different stages in the MC and subsequently the symptoms they may experience. The physical impact the MC had on players varied substantially and although they indicated they were usually aware of some of these prior to tracking, it was apparent that there was an enhanced understanding of the across the full cycle. Physical responses ranged from "really sick at my first cap, I had a jab to stop me being sick in order to play", (Participant 7) and "the weeks leading up to and during my period, my strength is lacking, and fatigue is through the roof" (Participant 10). Meanwhile, Participant 5 explained:

"I probably just struggle with like a bit of lower back pain and stuff, and then mm-hmm. I find it hard there, especially like if we're doing like a hard session, like a pitch session or conditioning session, then I would struggle and like I'm like, oh God, my back's a bits. Yeah. But you carry on. Yeah. Power through it."

Beyond such physical responses, a range of emotional and "mental" symptoms were also identified. For instance, Participant 3 explained: "I think, like I said, from my tracking really, and like being more aware of what stage I'm at, like the week before, like I know I'm, more grumpy and things like that. I know what food treats, I wanna crave, crave, crave ... ". Further, as Participant 10 shared it helped her to "understand how I am feeling and link it back to the cycle". Such emotional changes were a repeated issue within the cohort and interacted with physical responses. For instance, some participants reported understanding they were more frustrated at certain points during their cycle, especially when they could not perform consistently; "I was frustrated in the gym because I can't lift the same as what I lifted the week before and the frustration becomes more and more" (Participant 4). Similarly, Participant 3 explained, "[It's] frustrating and it becomes all mental when actually there is a limiting factor in it being your body doing a natural thing".

Responding to the menstrual cycle and symptoms

The understanding of their menstrual cycle was perceived to be useful for athletes. As Participant 2 explained:

"I think like before I thought it [MC tracking] was a bit of a fad. I didn't really, it was just like a period, it is what it is ... But helping me understand, uh, that a little bit more has helped me. Just kind of like use it more to my advantage rather than it just being there, actually doing something with it."

With regards to "doing something with it", athletes discussed a variety of changes they made because of their enhanced understanding of their MC. This included tangible actions such as, "packing extra pads etc in my bag" (Participant 4) and "Helping plan out my training sessions" (Participant 9). As Participant 7 explained:

"Well, like I, I know when I'm gonna be coming on ... so I can like say if, prepare. Yeah, prepare. So, like, I know like if I got like a game coming up when I was playing as wasps I was on, I felt really ill. So, I made sure I had like all the stuff like to help me to get through that day. Mm-hmm. And I had to drink more water to eat more and stuff so I didn't feel dizzy or whatever. So, you can like prepare extra."

Participant 12 appreciated that the app provides tangible information to help manage symptoms, "[The app] gives advice of what food swaps ... if craving unhealthy food". Aspects of creating routines and feeling more "in control" were reported by Participant 11 and 12. Meanwhile, other participants explained that a better understanding of their MC allowed them to tailor their training. Participant 1 simply stated, "Essentially maximise planning as much as I can and assess when to push or hold back". Participant 8 explained:

"It's [tracking] amazing cause then you don't really have to like, go your way to like, tell 'em [coaches] like it's all down there so they can see it. Yeah. It's just like perfect as it's a good way of tracking cycles and symptoms. I could then maybe focus my training around that in order to improve my performance."

Similarly, Participant 1 explained she would complete "analysis work or any extras" when feeling lethargic and Participant 12 said, "I can adapt my training to fewer exerting exercises when I know I'm going to struggle the most and get myself worked up". Participant 5 expanded upon this:

"I suppose like [tracking has a] good impact. I am able to identify which stage of my menstrual cycle I'm in or leading up to – this means I can adapt my training to less exerting exercises when I know I'm going to struggle the most and get myself worked up/frustrated. Like I know cause I'm currently on like I know to like avoid any alcohol fatty foods and it's like they got good signposts on there, what you should be doing."

Other participants found it useful to help them mentally prepare for potential negative impacts on performance in training or competitions, as Participant 11 discussed, tracking her cycle allowed her to "prepare for the worst", while a few athletes reported that the app made them become more "switched on" and "more aware of the physical/cognitive changes", which they had not taken into account previously. Recognition of symptoms through tracking the MC allowed participants to relate their "bad sessions" to their MC. Participant 11 explained, "If I've had a bad session, I know why it is". Consequently, participants explained that the MC tracking app helped with their "mental attitude towards bad sessions" (Participant 11) and enabled them to mentally prepare; "I know when I'm going to feel a bit weaker, so I kind of fight that mental battle" (Participant 2). Summarising views of many, Participant 6 explained:

"I think it's good that it's positive that it's just out in the open as a normal checklist. As a person who does not struggle with the physical aspect of periods (period pains and heavy bleeding), I personally believe my emotional and mental state is most heavily impacted so it's good to note these down. And it's a huge break away from stigma and slowly breaking that down."

Participant 8 explained it also reduced their concerns that coaches would think they were not training hard enough:

"They [coaches] know what's going on ... like they don't, like question it. I'm going to be off that day and training, not worried their [coaches], not thinking "I'm just slacking, slacking" and all, like, I'm tired or whatever. It's just to do with that [menstrual cycle], so that's good."

However, participants were a little hesitant in drawing together insights on their MC symptoms and training requirements for a variety of reasons. For instance, Participant 1 shared, "If you've got niggles or any areas of tightness, it [the app] makes you consciously think about it". Additionally, some participants did not want there to be an overemphasis placed on their MC, as Participant 7 stated, "it frustrates me when my teammates put their poor performance down to their menstrual cycle. I accept menstrual cycles have an impact, but I don't feel they should be used an excuse". Similarly, Participant 5 shared, "But I do think it needs to be said that even if we have a combination of symptoms and either internal/external factors going on that may affect our performance it shouldn't all be blamed on our period, it is not an excuse". Particularly, some participants were concerned that it may contribute to a negative stigma regarding female athletes:

"I think some people think Um, you know, "[name of player] is like not being like strong enough, fast enough, fit enough", but like, yeah, we're not gonna be, we're not mini men. Like, we're not gonna have their like ability, but, you know, we are players on our own right. And we have our own ability. So, it might not be as close to the men in that sense, but like, you know, we have to just deal with a lot more stuff like menstrual cycles, we've just gotta push through those barriers really (Participant 9)."

Enhanced relationships

In addition to the individual benefits associated with tracking their menstrual cycle, participants also discussed a range of relationship-related benefits. Specifically, participants indicated that because of tracking their MC they felt they were better positioned to communicate with coaches and staff regarding their experiences and symptoms. Additionally, participants highlighted the discussions that teammates engaged related to tracking their cycle and the subsequent enhanced understanding that occurred as they shared this experience.

Improving communication and interactions with coaches and support staff

Participants indicated that there was a lack of confidence or openness regarding talking about the MC. Participant 7 summarised:

"Personally, I wouldn't mind [talking to coaches about MC] because I can see the benefits of it, but I can also see why woman would not want to disclose it as it is quite private information and still stigmatised as an embarrassing subject to discuss. It may be especially difficult for some if the coaches are male. It can be difficult but not understanding 'cause they don't have one. But like having that they can understand it better and it's better, like better for both. Yeah, for them and us as well."

Participant 12 explained similar feelings, "For some shy people, I think it should be optional to disclose". Several participants suggested a difference between comfort in discussing their MC with male compared to female coaches, "[I am] Fine with female staff, probably wouldn't as much as with male coaches" (Participant 11).

Despite some hesitation regarding discussing the MC, participants perceived it was important to consider, with Participant 9 explaining that, "If more of us are open and then they [staff] get more comfortable talking about it then it'll [MC] become more normal". For those participants who were less comfortable discussing their MC, it was perceived that the app was helpful. For instance, Participant 11 shared, "I'm glad the app gives you an option to not have that awkward conversation unless something is serious or my symptoms are badly affecting my training". Similarly, Participant 6 explained:

"It's good for us to let the coaches know without having to talk to them all the time because they've got loads of us and it's just much easier. I think it's useful as it can explain why I might be performing better/worse."

Meanwhile, Participant 4 shared, the app allowed players to be "All on the same page as medical staff and coaches". Moreover, Participant 10 felt that the information helped coaches to know how to approach us sometimes and initiate conversations.

As well as enhancing communication, participants perceived that their coaches having more knowledge of their cycle was useful because, coaches could "have a little more empathy" (Participant 5) and respond accordingly. Participant 4 further explained:

"It's good to know. And during my stage of menstruation, I appreciate the extra words of encouragement and support. I like it when the coaches tell me more so than normal that I'm doing/have done a good job, and I feel this improves my performance. Also, for the coaches to know where we all are and how we're feeling and like supplements wise, like what we can be taken."

Of note, however, frustration was apparent among some participants when they perceived that coaches and staff did not use their tracking data to tailor sessions to their needs. That is, despite recognising that "Periods are an impossible factor to manage as a whole squad" and that "Everyone's cycle is different" (Participant 8). There was a desire to see, "a specific training plan that accommodates the different stages of my cycle" (Participant 6). Participants shared perceptions that coaches should adapt training with the information collected through tracking; "individualised gym sessions suited around your periods to maximise performance levels".

Shared experience with teammates

Interestingly, through tracking their menstrual cycle, participants indicated that it had subsequently resulted in more conversations with teammates and greater understanding of the different and shared experiences they had. Participant 4 explained they've "become closer talking about our periods". Similarly, Participant 6 thought that tracking was beneficial because:

"I definitely didn't realise how much it can impact the training and also that of my teammates, which I think is positive. I think this also helps me to support them when they're struggling and encourages better emotional connectivity and compassion amongst the team as a whole."

Greater insight regarding their menstrual cycle and the potential impacts across teammates was seen as particularly useful when seeking to understand individual's moods. As participant 5 explained when reflecting on her interactions with teammates:

"Yeah ... Like, I just thought you'd [teammate] just be a grumpy bitch... and it's normal. It is normal. I think that's the thing. Like I used to think with staff, you'd be like, "oh, there's something wrong with you". But there's nothing wrong with you. Everyone's different. Everyone like obviously at different times as well. So, it's knowing where you're at and where other people are at and things like that in order to support your teammates."

Additionally, Participant 4 explained they've "become closer talking about our periods". For instance, participants explained how they have overcome symptoms as a team and providing additional support to teammates such as encouraging better emotional compassion amongst the team. The app allowed participants to understand the individual experiences of teammates to support, but also recognise they are all "in the same boat". Consequently, an increased understanding of their own MC symptoms, and having more open discussions with their

teammates, has enabled athletes to better understand what others on their team need from an individual perspective. As Participant 4 summarised:

"Yeah, I think so. It's always tricky in a team sport because obviously, especially with something like menstrual cycle, we are all at different stages of a menstrual cycle. But I guess just having an individual understanding of that would allow us to be able to control the factors that might negatively influence. So try and even use them as a positive and thinking of different ways to overcome said symptoms as a team as guaranteed not just one of us may be struggling with our menstrual cycles."

Discussion

The purpose of this study was to understand female rugby players' perceptions of MC tracking. Overall, the findings of this study emphasised that MC tracking had numerous benefits for the players. Predominantly, it appeared that participants experienced benefits directly related to themselves; including the understanding of their MC and associated responses. Furthermore, participants perceived that it was beneficial for their relationships with others, facilitating opportunities for easier and enhanced conversations regarding their MC, a topic which teammates could bond over, and enhanced relationships with coaches/support staff. However, participants did express some caution that their MC should not be overly emphasised.

With regards to the individual benefits, aligned with previous research in wider populations, players liked using the tracking app to gain insights into their MC such as regularity, and associated symptoms (e.g., mood) aligned with previous research (e.g., O'Loughlin et al., 2023; Worsfold et al., 2021). Particularly, among this study, tracking increased self-awareness of the MC and its impact on training/performance, allowing players to gain insights into symptoms and potential impacts of their MC that they had not previously considered. The increase in awareness and the acknowledgement it had upon training allowed players to better manage symptoms and, in some cases, manage expectations they were placing on themselves. For instance, players found that when they had a bad session they reflected on the app and understood that their performance may be explained by being in a specific phase of their MC. Being able to attribute a poor performance to their menstrual cycle, rather than to themselves (i.e., poor skill, in ability to execute etc), may help to mitigate the potential detrimental impact losses or poor performances can have on athletes' confidence.

However, interestingly, some athletes were hesitant use their menstrual cycle to help explain poor performances, because they did not want it to be used as an excuse. Such sentiments appeared to be reflective of a concern from the participants that they did not want to seem like adaptations were required due to their sex (i.e., aware of comparisons to the men's team) and because of some ongoing stigma related to the MC. This may be inherently underpinned by behaviours and perceptions within sport, derived from a male perspective and reinforced by Sport and Exercise Science research which has been predominately completed with male athletes and "applied" to female athletes. The sex data gap was reported

by Cowley et al. (2023) describing "Invisible Sportswomen", with only 6% of 5261 publications specifically with female participants. It is an interesting perspective that female players wish to avoid "adaptation due to their sex" from a biological perspective (MC). Fundamentally biological sex is a determinant of athletic performance due to differences in anatomy and physiology dictated by sex chromosomes; prior to puberty the sex differences in athletic performance are minimal (American College of Sports Medicine, 2023). Support is required for female athletes, and included within coach education, to understand the physiological differences between male and female athletes to overcome the comparisons between sexes and view them in their own rights. This is reinforced by research conducted by Nolan et al. (2023) which highlighted strength and conditioning coaches in elite international women's rugby consider sex-specificity when devising physical preparation as a function of training experience, rather than physiological between-sex differences, with conflicting understanding of female-specific considerations.

Whether athletes used their MC tracking to help explain performance or not, what was apparent was it allowed many athletes to seek adaptations to their training. For instance, in Gamito's (2021) study 35.7% of athletes reported the necessity to decrease participation in training during their menstruation. One may anticipate that, drawing on more explicit insights gained from a tracking app, the tailoring of such adaptations and changes required may be more effective and or efficient on an individual basis, as and when symptoms present. Particularly given that, as detailed in these findings, participants recognised that through using the app they were able to have better exchanges of information with coaches and support staff, who will play a key role in the tailoring of their training.

Alongside the adaptation of their training, some participants also highlighted the benefits of using the app to identify management strategies to reduce the negative impact of symptoms on performance to prevent "bad sessions" or poor performances. Specifically, some participants used the patterns of their MC to their advantage and adapted accordingly, taking an holistic approach allowing athletes to become "better versions" of themselves as people and athletes. For instance, in the current study, the MC tracking app provided advice on foods to consume which may help reduce food cravings. Of importance to note, it has been identified that some apps lack the ability to impact symptom management (e.g., impact on knowledge, awareness, behaviour change, etc), and consequentially research reported symptom management content should be integrated into apps to improve user experiences (Trépanier et al., 2023). For instance, an examination of 12 apps identified that only 10% had interventions designed to manage menstrual pain. However, caution should be applied ensuring advice and guidance provided by the app is underpinned by research and evidence for recommendations provided. If achieved successfully, tracking apps may support athletes to be proactive in MC symptom management and reduce concerns of over emphasis or excessive focus being placed on their MC as a result of tracking.

Beyond the individual benefits associated with tracking, the current findings provide some intriguing insights into

individual and group factors that relate to the openness of conversation about the MC. Participants indicated there was a lack of confidence or openness regarding talking about the MC due to the topic being stigmatised and an embarrassing subject to discuss. This is consistent with previous findings which had identified the challenges some athletes encounter when attempting to discuss their MC (e.g., Brown et al., 2021) and the need for such conversations to reflect socio-cultural norms relevant for athletes and coaches from various cultural backgrounds (Clarke et al., 2021). Specifically, again aligned with previous literature (e.g., Brown et al., 2021; Findlay et al., 2020), many athletes in the current study indicated an openness to talk about the MC to female staff, but there was variation in the comfort athletes felt regarding talking to male coaches was evident. This is consistent with previous findings in women's rugby in which only 12% of players had previously spoken to staff about their menstrual cycle and the most common barrier to speaking to staff was reported to be "male staff" (29%; Heyward, Emmonds, et al., 2022).

Stigma has been identified as a major barrier to initiating conversations with professionals around the MC (Gulliver et al., 2012). This stigma and taboo associated with menstruation may impede an athlete seeking help or the support staff from approaching this topic with female athletes (Slade et al., 2009). However, for the participants in the current study, the process of tracking played an important role in facilitating conversations and increasing individual's comfort in talking to coaches and support staff about their MC. Particularly, it was viewed as beneficial for athletes who were shy or less comfortable talking about their MC. Athletes perceiving that they can share information with their coaches about all pertinent issues, including their MC, is important because coaches are better able to support their athletes' development if they know them well (e.g., Jowett & Cockerill, 2002) and performance outcomes are directly impacted by the athlete-coach relationship (Poczwadowski et al., 2002). Moreover, previous research has suggested that athletes perceive that coaches do not fully understand the impact the MC has on their performance (Brown et al., 2021). Communication allows the transmission of information and common understanding from one person to another (Lunenburg, 2010). For an athlete-coach relationship to be efficient and beneficial, both parties need to be willing to engage in conversation, and it appears that MC tracking process may be a tool to make such conversation easier.

A unique finding in the current study was that, beyond the individual approaches players have adopted to deal with the impact of the MC, players had also started to deal with symptoms as a team. Particularly players perceived they had become closer whilst talking about their periods, with such conversation stimulated by the process of tracking their MC. This finding demonstrates how normalising the MC, through the use of a tracking app, enabled players to develop an understanding of their shared experience and promote an open and supportive environment. This provides practical application for other female team sports and individuals in training groups; coaches and support staff should facilitate and harness the benefits of peer support to maximise symptom management.

Despite the opportunity to bond over their MC, it was noted by participants that individualised responses and adaptations

to their particular symptoms were desired. Such sentiments were similarly shared by Langan-Evans et al. (2023) who stated that despite similar symptomologies across cohorts, female athletes cannot be treated with a "one size fits all" approach when formulating training and/or nutritional strategies. Furthermore, aside of the benefits that participants highlighted regarding tracking their MC, there was an small undercurrent of concern from the participants that an overemphasis on their MC or attributing of poor performances to their MC may occur. Particularly, participants were concerned that female athletes may always be viewed as "weaker" if accommodations have to be made according to their MC. Such a finding illustrates the pervasiveness of the stigma related to the MC (e.g., Gulliver et al., 2012) as well as the ongoing challenges female athletes encounter as they attempt to break through the traditionally male-dominated world of professional sport (e.g., Hardy, 2017). In a society in which female athletes continue to be compared to their male counterparts, and thus feel compelled to prove themselves as athletes, such concerns regarding physiologically necessary and valuable adaptations are likely to remain. Thus, it is important that when introducing MC tracking or engaging in conversations regarding MC and associated adaptations for individuals in response to symptoms, one is aware of this broader societal context and the potential for hesitation to be present in female athletes.

Applied implications

Overall, based on the results, it appears that MC tracking could be beneficial across a range of athletes and thus, the first recommendation is that it should be introduced across women's teams. It is also apparent that additional work alongside tracking systems may be beneficial. For instance, participants indicated that they found that tracking their cycle was beneficial because it allowed them to learn more about their menstrual cycle and symptoms. However, knowledge of their symptoms and cycle without any subsequent tailoring of their training or attempts of staff to understand what each individual athlete was experiencing was frustrating. Thus, it is important that if tracking systems are introduced that staff and athletes engage in discussion regarding how tracking information will be used and what athletes can expect from staff with regards to tailoring information is required.

Additionally, athletes indicated that they found the tracking process beneficial because it helped them to learn about managing their symptoms. This occurred because advice was provided through the tracking app in response to symptoms that were reported. If organisations or teams are not able to introduce a tracking system, providing advice and guidance to athletes, particularly younger athletes, regarding how to manage their individual symptoms throughout their cycle would potentially replicate this benefit. Finally, as the results demonstrated the tracking process facilitated shared experiences and enhanced communication with coaches. To further enhance this benefit and/or ensure those who potentially do not have access to a tracking system can also gain this benefit, we would suggest that a series of group workshops, which are delivered by individuals with expertise in this area (e.g., physiologists or team doctors) to athletes and coaches together (and

potentially parents if athletes are younger). Hosting workshops with all parties present is beneficial for ensuring that they are aware that they have received the same information and may present opportunities for facilitated discussions of pertinent issues and concerns.

Limitations and future research

When considering the results of this study, the limitations should also be considered. Specifically, the data were obtained from one-off interviews, limiting the insights that may have been provided if participants had been asked at different times in the season or within their cycle. Secondly, some players who were interviewed had only recently became a part of the national training squad (i.e., in the last year) and as such, they are relatively early in their journey of engaging with MC tracking. Thus, they may not have encountered all the benefits or challenges. Additionally, it is important to recognise that although this study sought to explore engagement with MC tracking in general, the participants in the current study were using a specific app to track their MC. There are different approaches to tracking MC (pen and paper, wellness monitoring programmes), thus future research may benefit from considering the range of tracking approaches available. Particularly, because the MC tracking app the participants were using provides information (e.g., nutritional guidance, which may not be evidence-based) in response to the information athletes provide, this may have influenced the results of the current study. In conjunction, coaches' perceptions of the tracking process were not collected within this study, and thus we are unaware if the athletes' perceptions of the impact on their relationships with coaches were also experienced by coaches themselves.

It should be noted these results are from a specific cohort of female senior elite rugby union players and the intention was not to produce results that are representative of all female athletes (i.e., the intention of the study is not to fulfil the requirements of statistical-probabilistic generalisability; Smith, 2018). Rather, the emphasis here is on transferability (i.e., the extent to which the results transfer to another setting; Smith, 2018). Thus, we would encourage readers to consider the extent to which the findings presented may apply to their context, team, and/or experience.

Based on the current findings, there are numerous areas for future research. Specifically, adopting a longitudinal approach to exploring athletes' (and coaches') perceptions of tracking their MC over a season would be useful. Particularly, such insights would enable greater understanding of the potential impact tracking information may have around different competitions. Secondly, further examination of the insights regarding team interactions and the benefits of MC for creating shared experiences would be useful. Particularly, exploring this at a team level to identify if there are any cultural or contextual factors that positively or negatively influence MC tracking facilitating shared experiences is needed. Finally, exploration of the best means through which to share information via tracking apps in response to symptoms, as well as insights into the most pertinent information to support elite athletes would be beneficial.

Conclusion

In conclusion, tracking of the MC was perceived to have a range of positive impacts on rugby players. Specifically, elite female rugby players reported varying impacts of their MC, but all indicated that tracking aided them in noticing patterns within their MC and they now had a better understanding how to react and respond to their own personal symptoms as well as harnessing the support of their teammates. Athletes indicated that tracking their MC in a performance setting enhanced relationships with their teammates as participants discovered that they were not alone in suffering with MC associated symptoms, and discovered talking about how to mitigate symptoms allowed one another to support each other. Further, participants also found that MC tracking improved communication with coaches/support staff.

Disclosure statement

No potential conflict of interest was reported by the author(s).

ORCID

Camilla J. Knight  <http://orcid.org/0000-0001-5806-6887>

References

American College of Sports Medicine. (2023). *ACSM releases expert consensus statement: The biological basis of sex differences in athletic performance*. Retrieved October 5, 2024, from <https://www.acsm.org/news-detail/2023/09/29/acsm-releases-expert-consensus-statement-the-biological-basis-of-sex-differences-in-athletic-performance#:~:text=Biological%20sex%20is%20a%20determinant,in%20athletic%20performance%20are%20minimal>

Bowes, A., Lomax, L., & Piasecki, J. (2022). The impact of the COVID-19 lockdown on elite sportswomen. *Managing Sport and Leisure*, 27(6), 513–529. <https://doi.org/10.1080/23750472.2020.1825988>

Brown, N., Knight, C. J., & Forrest, 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>

Bruinvels, G., Burden, R., Brown, N., Richards, T., Pedlar, C., & Clarke, S. L. (2016). The prevalence and impact of heavy menstrual bleeding (menorrhagia) in elite and non-elite athletes. *PLoS One*, 11(2), e0149881. <https://doi.org/10.1371/journal.pone.0149881>

Clarke, A., Govus, A., & Donaldson, A. (2021). What male coaches want to know about the menstrual cycle in women's team sports: Performance, health, and communication. *International Journal of Sports Science & Coaching*, 16(3), 544–553. <https://doi.org/10.1177/1747954121989237>

Cowley, E. S., Olenick, A. A., McNulty, K. L., & Ross, E. Z. (2023). "Invisible sportswomen": the sex data gap in sport and exercise science research. *Women in Sport & Physical Activity Journal*, 29(2), 146–151. <https://doi.org/10.1123/wspaj.2021-0028>

Del Vecchio, A., Negro, F., Holobar, A., Casolo, A., Folland, J. P., Felici, F., & Farina, D. (2019). You are as fast as your motor neurons: Speed of recruitment and maximal discharge of motor neurons determine the maximal rate of force development in humans. *Journal of Physiology, Paris*, 597(9), 2445–2456. <https://doi.org/10.1113/JP277396>

Elliot-Sale, K. J., Minahan, C. L., Janse de Jonge, X. A. K., Ackerman, K. E., Spila, S., Constantini, N. W., Lebrun, C. M., & Hackney, A. C. (2021). Methodological considerations for studies in sport and exercise science with women as participants: A working guide for standards of practice for research on women. *Sports Medicine*, 51(5), 843–861. <https://doi.org/10.1007/s40279-021-01435-8>

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

Gamito, A. N. (2021). *Menstrual cycle, impact on athletic performance and nutritional considerations* [Thesis submitted]. University of Porto.

Gordon, D., Hughes, F., Young, K., Scruton, A., Keiller, D., Caddy, O., Baker, J., & Barnes, R. (2013). The effects of menstrual cycle phase on the development of peak torque under isokinetic conditions. *Isokinetic Exercise Science*, 21(4), 285–291. <https://doi.org/10.3233/IES-130499>

Gulliver, A., Griffiths, K. M., & Christensen, H. (2012). Barriers and facilitators to mental health help-seeking for young elite athletes: A qualitative study. *BMC Psychiatry*, 12(1), 1–14. <https://doi.org/10.1186/1471-244X-12-157>

Hardy, E. (2017). The female 'apologetic' behaviour within Canadian women's rugby: Athlete perceptions and media influences. In S. Hedenborg & G. Pfister (Eds.), *Gender, Media, Sport* (pp. 35–47). Routledge.

Heather, A. K., Thorpe, H., Ogilvie, M., Sims, S. T., Beable, S., Milsom, S., Schofield, K. L., Coleman, L., & Hamilton, B. (2021). Biological and socio-cultural factors have the potential to influence the health and performance of elite female athletes: A cross sectional survey of 219 elite female athletes in Aotearoa New Zealand. *Frontiers in Sports and Active Living*, 3, 27. <https://doi.org/10.3389/fspor.2021.601420>

Heyward, O., Emmonds, S., Roe, G., Scantlebury, S., Stokes, K., & Jones, B. (2022). Applied sports science and sports medicine in women's rugby: Systematic scoping review and delphi study to establish future research priorities. *BMJ Open Sport and Exercise Medicine*, 8(3), e001287. <https://doi.org/10.1136/bmjsem-2021-001287>

Heyward, O., Nicholson, B., Emmonds, S., Roe, G., & Jones, B. (2020). Physical preparation in female rugby codes: An investigation of current practices. *Frontiers of Sports and Active Living*, 2, 1–14. <https://doi.org/10.3389/fspor.2020.584194>

Jowett, S., & Cockerill, I. (2002). *Solutions in sport psychology*. Thomson Learning.

Julian, R., Hecksteden, A., Fullagar, H. H., Meyer, T., & Lucía, A. (2017). The effects of menstrual cycle phase on physical performance in female soccer players. *PLoS One*, 12(3), e0173951. <https://doi.org/10.1371/journal.pone.0173951>

Kishali, N. F., Imamoglu, O., Katkat, D., Atan, T., & Akyol, P. (2006). Effects of menstrual cycle on sports performance. *The International Journal of Neuroscience*, 116(12), 1549–1563. <https://doi.org/10.1080/00207450600675217>

Knott, E., Rao, A. H., Summers, K., & Teiger, C. (2022). Interviews in the social sciences. *Nature Reviews Methods Primers*, 2(1), 73. <https://doi.org/10.1038/s43586-022-00150-6>

Langan-Evans, C., Hearris, M. A., McQuilliam, S., Burke, L. M., Stellingwerff, T., Elliott-Sale, K. J., & Morton, J. P. (2023). Hormonal contraceptive use, menstrual cycle characteristics and training/nutrition related profiles of elite, sub-elite and amateur athletes and exercisers: One size is unlikely to fit all. *International Journal of Sports Science & Coaching*, 19(1), 113–128. <https://doi.org/10.1177/17479541231163088>

Li, K., Urteaga, I., Wiggins, C., Druet, A., Shea, A., Vitzthum, V., & Elhadad, N. (2020). Characterizing physiological and symptomatic variation in menstrual cycles using self-tracked mobile-health data. *Digital Medicine*, 3(1), 79. <https://doi.org/10.1038/s41746-020-0269-8>

Lunenburg, F. C. (2010). Communication: The process, barriers, and improving effectiveness. *Schooling*, 1(1), 1–10.

McNulty, K. L., Elliott-Sale, K. J., Dolan, E., Swinton, P. A., Ansdell, P., Goodall, S., Thomas, K., & Kicks, K. M. (2020). The effects of menstrual cycle phase on exercise performance in eumenorrheic women: A systematic review and meta-analysis. *Sports Medicine*, 50(10), 1813–1827. <https://doi.org/10.1007/s40279-020-01319-3>

Nolan, D., Horgan, P., MacNamara, A., & Egan, B. (2023). 'There's a perfect way to do things, and there's a real way to do things': Attitudes, beliefs and practices of strength and conditioning coaches in elite international women's rugby union. *International Journal of Sports Science & Coaching*, 18(5), 1456–1468. <https://doi.org/10.1177/17479541231169>

O'Brien, S., Rapkin, A., Dennerstein, L., & Nevatte, T. (2011). Diagnosis and management of premenstrual disorders. *The British Medical Journal*, 6(3), 342. <https://doi.org/10.1136/bmj.d2994>



O'Loughlin, E., Reid, D., & Sims, S. (2023). Discussing the menstrual cycle in the sports medicine clinic: Perspectives of orthopaedic surgeons, physiotherapists, athletes and patients. *Qualitative Research in Sport, Exercise & Health*, 15(1), 139–157. <https://doi.org/10.1080/2159676X.2022.2111459>

Patton, M. Q. (2023). *Qualitative research & evaluation methods: Integrating theory and practice*. Sage publications.

Poczwadowski, A., Barott, J. E., & Henschen, K. P. (2002). The athlete and coach: Their relationship and its meaning. Results of an interpretive study. *International Journal of Sport Psychology*, 33(1), 116–140.

Quarrie, K. L., Handcock, P., Waller, A. E., Chalmers, D. J., Toomey, M. J., & Wilson, B. D. (1995). The New Zealand rugby injury and performance project. III. Anthropometric and physical performance characteristics of players. *British Journal of Sports Medicine*, 29(4), 263–270. <https://doi.org/10.1136/bjsm.29.4.263>

Rubin, H. J., & Rubin, I. S. (2012). *Qualitative interviewing: The art of hearing data*. Sage.

Shanmugam, V., & Jowett, S. (2016). Creating a successful and effective coaching environment through interpersonal sports coaching. In S. Cotterill, N. Weston, & G. Breslin (Eds.), *Sport and Exercise Psychology* (pp. 215–238). Wiley.

Slade, P., Haywood, A., & King, H. (2009). A qualitative investigation of women's experiences of the self and others in relation to their menstrual cycle. *British Journal of Health Psychology*, 14(1), 127–141. <https://doi.org/10.1348/135910708X304441>

Smith, B. (2018). Generalizability in qualitative research: Misunderstandings, opportunities and recommendations for the sport and exercise sciences. *Qualitative Research in Sport, Exercise & Health*, 10(1), 137–149.

Smith, B., & McGannon, K. R. (2018). Developing rigor in qualitative research: Problems and opportunities within sport and exercise psychology. *International Review of Sport & Exercise Psychology*, 11(1), 101–121.

Smith, B., & Sparkes, A. C. (Eds.). (2016). Interviews: Qualitative interviewing in the sport and exercise sciences. In *Routledge handbook of qualitative research in sport and exercise* (pp. 125–145). Routledge.

Smith, M. J., Adams, L. F., Schmidt, P. J., Rubinow, D. R., & Wassermann, E. M. (2002). Effects of ovarian hormones on human cortical excitability. *Annals of Neurology*, 51(5), 599–603. <https://doi.org/10.1002/ana.10180>

Sparkes, A. C., & Smith, B. (2009). Judging the quality of qualitative inquiry: Criteriology and relativism in action. *Psychology of Sport & Exercise*, 10(5), 491–49.

Thorne, S. (2016). *Interpretive Description*. Routledge.

Thorne, S., Kirkham, S. R., & MacDonald-Emes, J. (1997). Interpretive description: A noncategorical qualitative alternative for developing nursing knowledge. *Research in Nursing & Health*, 20(2), 169–177. [https://doi.org/10.1002/SICI\)1098-240X\(199704\)20:2<169::AID-NUR9>3.0.CO;2-1](https://doi.org/10.1002/SICI)1098-240X(199704)20:2<169::AID-NUR9>3.0.CO;2-1)

Trépanier, L. C. M., Lamoureux, É., Bjornson, S. E., Mackie, C., Alberts, N. M., & Gagnon, M. M. (2023). Smartphone apps for menstrual pain and symptom management: A scoping review. *Internet Interventions*, 31, 100605. <https://doi.org/10.1016/j.invent.2023.100605>

Worsfold, L., Marriott, L., Johnson, S., & Harper, J. C. (2021). Period tracker applications: What menstrual cycle information are they giving women? *Women's Health*, 17, 17455065211049905. <https://doi.org/10.1177/17455065211049905>