

# Menstrual cycle characteristics, perceived impact on performance, and barriers to communication: Perspectives of high-performance adolescent athletes in Singapore

Bernadette Cherianne Taim<sup>1,2,3</sup>  | Jamie Lye<sup>3,4</sup>  | Haresh T. Suppiah<sup>5</sup>  |  
Tin Wing Chan<sup>3</sup>  | Michael Chia<sup>6</sup>  | Anthea Clarke<sup>5</sup> 

<sup>1</sup>Department of Sport and Health Sciences, Technological University of the Shannon: Midlands Midwest, Athlone, Ireland

<sup>2</sup>SHE Research Group, Technological University of the Shannon: Midlands Midwest, Athlone, Ireland

<sup>3</sup>National Youth Sports Institute, Singapore

<sup>4</sup>Human Potential Translational Research Programme, Yong Loo Lin School of Medicine, National University of Singapore, Singapore

<sup>5</sup>Sport, Performance, and Nutrition Research Group, School of Allied Health, Human Services and Sport, La Trobe University, Bundoora, Victoria, Australia

<sup>6</sup>Physical Education and Sports Science Group, National Institute of Education, Nanyang Technological University, Singapore

## Correspondence

Haresh T. Suppiah, Sport, Performance, and Nutrition Research Group, School of Allied Health, Human Services and Sport, La Trobe University, Bundoora, VIC 3086, Australia.

Email: [h.suppiah@latrobe.edu.au](mailto:h.suppiah@latrobe.edu.au)

## Abstract

The purpose of this study was to examine the menstrual cycle (MC) characteristics, explore the impact on performance, and identify barriers to and facilitators of MC-related communication among high-performance female adolescent athletes in Singapore. Ninety athletes ( $15.4 \pm 1.8$  years) from multiple sports completed an online questionnaire. Eighty-four athletes were postmenarcheal (menarcheal age  $11.9 \pm 1.3$  years), including two who were using an oral contraceptive pill (OCP). Secondary amenorrhea, current or history of, was self-reported in 16% of athletes. Sixty-two percent and 67% of non-OCP athletes perceived that the MC affected their ability to train and compete, respectively. Athletes preferred speaking to a parent (85%) and a female figure (67%) about MC-related concerns. Through thematic analysis, three barriers to communication were constructed: (1) pervasive menstrual stigma, (2) constraints of the training environment, and (3) the low value placed on MC-related conversations. Two facilitators of communication were constructed: (1) respect athletes' individual experiences as menstruating girls and (2) foster a safe space for MC-related conversations. Findings demonstrated that menstrual irregularities are common in adolescent athletes and screening for MC disorders, particularly primary amenorrhea should be undertaken in this population, with clear support pathways for management including symptom mitigation. To support athletes in raising MC-related concerns when needed, structured communication pathways that consider individual preferences and involve a (female) point of contact should be established within the training environment. Improving menstrual health literacy among adolescent athletes before any misinformation or negative perceptions are firmly established may contribute to longevity in their athletic careers.

## KEYWORDS

female athlete, menstrual health education, menstrual health literacy, menstrual irregularities, menstrual symptoms, Southeast Asia, sports performance, youth sports

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## 1 | INTRODUCTION

Sports participation and success among girls and women have increased over the last few decades. However, until recently, there has been less consideration for female athletes' unique physiology, specifically the menstrual cycle (MC) and its impact on training and performance in sport. While it is unknown whether the cyclical fluctuations in ovarian hormone concentrations across the MC affect physical performance outcomes,<sup>1</sup> recent studies have suggested a perceived effect of the MC on training and performance.<sup>2,3</sup> For example, 66% of elite Australian athletes who were preparing for the 2020 Olympic and Paralympic Games reported that their MC affected their training performance.<sup>2</sup> Additionally, in a sample of cross-country skiers and biathletes, 47% indicated that their physical fitness was reduced during their period and was associated with negative MC-related symptoms.<sup>3</sup> While these studies provide insights into how senior athletes perceive their MC in sport, the perceptions of younger female athletes have yet to be explored. As previous research among Asian adolescent schoolgirls demonstrated that premenstrual symptoms impaired perceived academic concentration and performance,<sup>4</sup> it would be interesting to explore how these perceptions might translate into a sporting setting.

Beyond performance considerations, the MC is also an indicator of health, specifically bone health in adolescent athletes. As demonstrated in the syndrome of relative energy deficiency in sport (REDs), a compromised menstrual function in athletes is predominantly a manifestation of low energy availability (LEA), which can exert deleterious long-term effects on bone health.<sup>5</sup> This is particularly concerning among younger athletes, given that adolescence is a critical period for bone development and suboptimal bone mass acquisition during this time may lead to increased risks of bone stress injuries.<sup>6</sup> Therefore, understanding the MC characteristics and burden of MC-related symptoms in adolescent female athletes is integral to developing screening practices and management strategies within youth sports to ensure long-term athlete development. However, limited evidence exists regarding the MC characteristics of high-performance adolescent athletes in Singapore and the wider Southeast Asian region.

Given the potential health and performance implications, ensuring menstrual health (e.g., timely diagnosis and treatment, age-appropriate MC education, and freedom from menstrual stigma and distress) ought to be a key consideration in the training environments of adolescent postpubertal female athletes.<sup>7</sup> However, the menstrual stigma still exists in society and hinders MC-related conversations among athletes and coaches/support staff.<sup>3,8–10</sup> For instance, at the elite level, international female rugby

players reported some discomfort with highlighting menstrual concerns within their sport, especially in male-dominated environments.<sup>8</sup> Furthermore, only 27% of elite female endurance athletes had MC-related conversations with their coaches.<sup>3</sup> Other barriers to communication included poor knowledge of female-specific physiology and the lack of an evidence-based framework to support female athletes.<sup>9,10</sup> While research examining athletes' in-depth lived experiences of the MC in sport is emerging, most of these published studies are focused on adults and little is known about the experiences of adolescent female athletes.

Research in the general population highlighted that 48% of girls aged 14–21 years felt embarrassed about their periods and only 22% felt comfortable discussing their periods with a teacher.<sup>11</sup> The menstrual stigma may also perpetuate poor menstrual health literacy and lead to poor help-seeking behaviors. For example, only 6% of 5561 adolescent girls in Singapore reported seeking medical help for dysmenorrhea (i.e., painful menstruation), most likely due to an underlying belief that pain is a “normal” part of the MC.<sup>12</sup> In a similar study, 41% of 1092 girls indicated that they would prefer to menstruate every 3–4 months.<sup>4</sup> This is concerning as anecdotally, adolescent athletes may perceive “losing periods” as a positive occurrence (e.g., less inconvenience) or an affirmation of their training efforts (e.g., training so hard that menstruation ceases). Therefore, understanding the barriers that exist and shifting cultural attitudes that restrain open dialogue about the MC in female athletes, and foregrounding the experiences and perceptions of female adolescent athletes should be encouraged.

Despite an increase in research attention around the MC in the sport and exercise medicine field, data remain scarce in the Southeast Asian region, where cultural and religious taboos on menstruation continue to persist. For example, some religions that are widely practised in Southeast Asia view menstruating women as impure and they are prohibited from participating in religious activities.<sup>13</sup> Considering the differences in how menstruation is socially and culturally framed, research in this region may provide more contextually relevant information. To inform how best to support young female athletes in this aspect, there is a need to fundamentally consider their menstrual health and their perceived impact of the MC on sports performance, while exploring how adolescent training environments can effectively facilitate such conversations. Therefore, the present study aimed to (i) examine the MC characteristics, (ii) explore the perceived impact of the MC on training and performance, and (iii) identify barriers to and facilitators of MC-related communication among high-performance female adolescent athletes in Singapore.

## 2 | MATERIALS AND METHODS

### 2.1 | Participants

Female adolescent athletes aged 12–20 years were recruited from a high-performance sports academy in Singapore from April to June 2021. Among 170 eligible athletes, 29% declined to participate. Parent/guardian informed consent was obtained for 97% ( $n=116$ ) of athletes who provided participant assent. A final sample of 90 athletes (age  $15.4 \pm 1.8$  years; height  $161.0 \pm 6.5$  cm; body mass  $52.8 \pm 8.7$  kg) across 14 sports completed the questionnaire with a response rate of 78%. Ethics approval for the study was obtained from the Singapore Sport Institute Institutional Review Board (PH-EXP-035).

### 2.2 | Questionnaire

The quasi-structured questionnaire, in English following Singapore's language of instruction, was based on a previous questionnaire examining aspects of the MC in exercising women and was adapted to the Singapore adolescent athletes' context.<sup>14</sup> The questionnaire was piloted with five athletes across different sports and age groups from the same sports academy in March 2021. To assess content understanding and gather feedback, a virtual interview was conducted by two researchers with each of the five pilot study participants. Based on the results of the pilot study, the questionnaire was refined to improve content understanding (e.g., rephrasing questions, inclusion of pictorial diagrams, and description of terminologies). The questionnaire responses gathered from the pilot study were not included in the final analyses.

The final questionnaire was hosted online on Qualtrics (Qualtrics) and comprised four main sections: (1) demographic information, (2) medical history and MC characteristics, (3) perceived impact of the MC on performance, and (4) communication practices regarding the MC. All athletes provided demographic data such as age, height, body mass, and competition level. Premenarcheal athletes only provided demographic information and their medical history. Postmenarcheal athletes reported information relating to menstrual health such as the age of menarche. Herein, postmenarcheal athletes refer to both oral contraceptive pill (OCP) users and non-OCP users. Non-OCP users reported further MC-related information such as MC length, period length, MC-related symptoms, and the perceived impact of the MC on training and competition. Lastly, communication practices of postmenarcheal athletes around the MC were explored using both closed- and open-ended questions. The branching-logic questionnaire

consisted of 53 closed-ended questions and three open-ended questions (Table 1).

### 2.3 | Data analysis

Data were analyzed using Microsoft Excel and Jamovi, version 2.3.13. The closed-ended questions were analyzed descriptively and are presented as mean  $\pm$  standard deviation, frequencies, and percentages. A chi-square test of independence was performed to examine the association between gynecological age (i.e.,  $\leq 3$  years or  $> 3$  years postmenarche) and self-reported MC length. Premenarcheal athletes ( $n=6$ ) and OCP users ( $n=2$ ) were excluded from the analysis of MC characteristics and the perceived impact of the MC on performance. A collaborative, codebook thematic analysis approach was used to analyze the open-ended responses.<sup>15</sup> A subset of the dataset was coded by two researchers (BCT and JL) independently, and this was followed by a collaborative and consensus discussion which produced the final codebook. The codebook was then applied to the entire dataset by the lead researcher (BCT), and thereafter, the codes were sorted into candidate topic summary themes at the semantic level. The alignment of these candidate themes and subthemes was reviewed, overlapping themes were collapsed, and clear definitions were derived for each label. Lastly, data extracts corresponding to each topic summary theme/subtheme were extracted and presented in verbatim quotations. Examples of the codes and coded extracts under the topic summaries of “constraints of the training environment; sub-theme: male coach—female athlete dynamic” and “pervasive menstrual stigma” are presented in Table 2.

## 3 | RESULTS

### 3.1 | Demographic characteristics

The athletes' demographic data are presented in Table 3. All athletes were competing at national ( $n=73$ ; i.e., national interschool competitions), regional ( $n=11$ ; e.g., Southeast Asian Games), or international ( $n=6$ ; e.g., Youth Olympic Games) levels. The average weekly training durations were  $11.0 \pm 6.2$  h (sport-specific),  $4.1 \pm 2.4$  h (gym-based), and  $2.5 \pm 2.7$  h (nonprescribed). The main ethnic compositions of athletes in this study were as follows: Chinese ( $n=74$ ), Malay ( $n=5$ ), Indian ( $n=3$ ), Eurasian ( $n=3$ ), and Others ( $n=4$ ). Six out of 90 athletes from the following sports were premenarcheal: badminton ( $n=1$ ), gymnastics ( $n=4$ ), and shooting ( $n=1$ ). Among these, two gymnasts were aged 15 and were considered to

TABLE 1 Examples of questionnaire items.

Questionnaire section	Example of questions
Demographic information	How tall are you (cm)? How much do you currently weigh (kg)? What is your sport? What level do you currently compete at in the sport you listed above?
Medical history and MC characteristics	Have you ever been diagnosed with any major diseases, or do you have a chronic medical condition? At what age did you have your first period? On average, approximately how many days are there from the start of one period (first day of bleeding) to the start of your next period (first day of bleeding)? Have your periods ever stopped for 3 months or more (without use of a contraceptive means and in the absence of pregnancy)? Do you regularly need to take any form of medication to relieve pain for MC-related symptoms?
Perceived impact of the MC on performance	Do you think your MC affects your ability to train? Have you ever missed training as a result of your MC or related symptoms? Do you think your MC affects your ability to race/compete? Have you ever missed a competition as a result of your MC or related symptoms? Do you feel that there is any point in your MC where you are able to perform better? Do you feel that there is any point in your MC where you feel your performance is worse?
Communication practices regarding the MC	Closed-ended questions Have you ever spoken to any of the following <sup>a</sup> about your MC (please select all that apply)? Who would you prefer to speak to regarding your MC? What is your preferred way/platform to communicate information regarding your MC to your coaches? Open-ended questions What do you see as things that may make it difficult to talk with any of the above personnel <sup>a</sup> regarding your MC? Why do these things make it difficult to initiate or participate in these discussions? During training, what do you think can be done so that it will be easier or more comfortable to discuss about the MC with your support staff (e.g., coaches)?

Abbreviation: MC, menstrual cycle.

<sup>a</sup>Refers to the following: parent, friends, doctor, sibling, coach, dietitian/nutritionist, psychologist, schoolteacher, physiotherapist, strength and conditioning coach.

be primary amenorrheic (i.e., the failure to reach menarche by age 15 years).<sup>16</sup> Only two out of 84 postmenarcheal athletes were currently using OCP, including one who was diagnosed with polycystic ovary syndrome (PCOS). One postmenarcheal gymnast (non-OCP) reported menarche at age 16 (i.e., a history of primary amenorrhea).

### 3.2 | Menstrual cycle characteristics

Among the non-OCP users ( $n = 82$ ), 66% reported *often* experiencing at least one negative MC-related symptom during the premenstrual and menstruation phases. Fifty-one percent of non-OCP athletes tracked their MC using specialist phone apps ( $n = 21$ ), diary/notes ( $n = 3$ ), and electronic/paper calendars ( $n = 18$ ). The MC characteristics of the athletes are summarized in Table 4. A chi-square test of independence showed that there was no statistically significant association between gynecological age and self-reported MC length (Figure 1).

### 3.3 | Perceived impact of MC on performance

Sixty-two percent ( $n = 51$ ) and 67% ( $n = 55$ ) of non-OCP athletes perceived that their MC affected their ability to train and compete, respectively. While 27% ( $n = 22$ ) reported having to miss at least one training session in the past year because of MC-related symptoms, none of the athletes had missed a competition for that reason. Non-OCP athletes reported modifying training (20%) and/or the way they competed (15%) due to MC-related symptoms. Regardless of whether athletes missed or modified training/competition, the most common reason/symptom reported was pain (93%). Forty-three percent ( $n = 35$ ) of non-OCP athletes reported that they performed “worse” during their period (Figure 2). Only 9% ( $n = 7$ ) of athletes felt that their MC does not affect them. While some athletes (29%) could indicate a time point across the MC where they perceived that their performance was “better,” 62% were unsure.

TABLE 2 Examples of codes and coded extracts.

Topic summaries	Constraints of the training environment <i>Subtheme: Male coach–female athlete dynamic</i>	Pervasive menstrual stigma
Codes	Not comfortable talking to men about this topic Feel that men do not understand what they experience	The menstrual cycle is personal and private and should be kept to self Social stigma/taboo Feelings of embarrassment and discomfort Insecurities Perceived to be a topic to be shared only when necessary
Coded extracts	difficult to talk to the other gender about it and when all your coaches are male it does not really help the situation. my coaches are all male If they are males They do not experience it for themselves and may not understand. uncomfortable to talk about menstrual cycles in the presence of male figures. Most of the coaches I have had are men; it just feels a bit awkward to be talking to him about it. predominantly male staff kind of still a taboo to talk about it I feel, especially with male staffs Talking to a male adult; do not want to make the other person feel uncomfortable. some of the people are male; males are usually harder to relate to because they do not experience the menstrual cycle Most men are not very understanding toward my situation They do not really understand and also because of the gender difference The personnel who is male; I do not feel comfortable talking to male about period I only tell girls about it different gender Most of the people I have to tell are men.	a little awkward to talk about it People do not really talk about these things so it will be something unusual to talk about It's not been a topic of conversation in our society no need to bring up the conversation anyway for it to just be awkward is not something you usually talk to someone about and its personal embarrassing or intimate topic to talk about not well-discussed topic especially in Singapore; meant to be kept to ourselves and hence it would be considered as weird or awkward if we were to openly talk about it sensitive topic makes it awkward weird kind of still a taboo to talk about it It's not something to randomly bring up I am shy to talk about it Singaporeans are not very open minded Uncommon topic deemed as dirty Taboo as it's not normalized

### 3.4 | Communication preferences and past experiences

As shown in Figure 3, the role and sex that most athletes preferred to speak to were parents (85%) and females (67%), respectively. Among postmenarcheal athletes ( $n = 84$ ), only 42% ( $n = 35$ ) have ever spoken to someone about their MC. While only 17% ( $n = 14$ ) spoke to their coach about the MC, 54% ( $n = 45$ ) indicated a willingness to speak to their coach (Figure 3). Concerning communication platforms for discussions about the MC, athletes preferred face-to-face contact (40%), purpose-built monitoring apps with coach access (17%), and messaging (11%). Thirty-one percent preferred to keep to themselves and the remaining 1% had no preference.

Only 11 out of 84 postmenarcheal athletes (13%) reported having a formal education session about the MC

within their sport. Seventy-one percent ( $n = 60$ ) were interested to learn more about the MC, specifically coping strategies for premenstrual symptoms (82%), MC and sports performance (65%), MC tracking (37%), menstrual health literacy (e.g., when to seek medical help; 32%), and communicating with coach/support staff about the MC (23%). Eighty-eight percent of athletes felt that there should be more open discussions about the MC in sport.

### 3.5 | Barriers to communication

Three overarching topic summaries and three subthemes related to the barriers to communication about the MC within the sporting environment were constructed: (1) constraints of the training environment, (2) pervasive

TABLE 3 Demographic information of athletes.

	<i>n</i>	Age of menarche (years) <sup>a</sup>	Gynecological age (years) <sup>a,b</sup>	Age (years)	Height (cm)	Mass (kg)	BMI (kg/m <sup>2</sup> )
Overall	90	11.9±1.3	3.5±2.1	15.4±1.8	161.0±6.5	52.8±8.7	20.3±2.6
Badminton	7	11.8±1.0	3.8±1.5	15.4±1.4	157.5±10.3	50.1±10.4	20.0±2.1
Bowling	6	11.7±2.2	3.2±2.1	14.8±0.4	156.9±5.0	54.2±9.2	22.0±3.4
Fencing	6	12.3±0.8	1.8±1.0	14.2±1.6	160.2±7.3	49.4±10.8	19.1±2.9
Golf	3	11.3±1.2	4.7±1.2	16.0±2.0	161.3±5.0	54.3±2.3	20.9±1.5
Gymnastics	6	15.0±1.4	0.0	14.5±1.0	154.7±6.9	41.1±7.8	17.0±2.0
Ice/speed Skating	1	12.0	5.0	17.0	153.0	48.0	20.5
Netball	23	11.6±1.2	3.9±2.4	15.5±2.1	163.9±5.9	56.1±8.3	20.8±2.7
Pencak Silat <sup>c</sup>	1	15.0	2.0	17.0	155.0	52.0	21.6
Shooting	13	12.1±1.3	3.7±2.3	15.5±1.9	159.8±4.1	47.9±7.0	18.7±2.2
Swimming	13	12.2±0.7	3.1±1.3	15.3±1.5	162.7±5.7	56.5±6.3	21.4±1.8
Squash	1	10.0	4.0	14.0	164.0	66.7	24.8
Table Tennis	4	12.0±0.0	3.0±1.8	15.0±1.8	162.5±4.9	54.9±7.2	20.7±2.0
Track and Field	5	10.6±0.9	5.6±2.3	16.2±1.6	165.4±6.2	55.6±4.1	20.3±0.2
Wushu	1	13.0	6.0	19.0	163.0	59.0	22.2

Abbreviations: BMI, body mass index; *n*, number of athletes.

<sup>a</sup>Only applicable to postmenarcheal athletes.

<sup>b</sup>Calculated as age (years)—age of menarche (years).

<sup>c</sup>An ethnic Malay martial art form that consists of two categories: artistic (e.g., choreographed movements) and contact (e.g., weight-categorized, full-contact, similar to taekwondo and judo).<sup>17</sup>

menstrual stigma, and (3) low value placed on MC-related conversations (Figure 4).

### 3.5.1 | Constraints of the training environment

Three subthemes were subsumed under the overarching topic summary of constraints within the training environment: (1) male coach–female athlete dynamic, (2) lack of a close and trusting coach–athlete relationship, and (3) lack of MC-specific education and communication pathways.

*Male coach–female athlete dynamic:* Many athletes found it difficult to talk about the MC within the training environment as their coaches or support staff were predominantly males, and they were not comfortable talking to them about the MC. Some athletes expressed that male coaches are unable to understand their situation as they have no lived experiences of the MC:

“It is difficult to talk to the other gender about it and when all your coaches are male it doesn't really help the situation” (Track and Field), “Most of the coaches I have had are men; it just feels awkward to be talking to him about it” (Track and Field), and “They

[males] don't experience it for themselves and may not understand” (Golf)

There was also an impression that talking about the MC would cause the male party to feel uncomfortable:

“Talking to a male adult; don't want to make the other person feel uncomfortable” (Bowling), and “[Males] normally don't like it and they find it disturbing” (Bowling)

*Lack of a close and trusting coach–athlete relationship:* Some athletes felt that they did not have a close enough relationship with their coaches for them to share about menstrual issues, which they perceived as a personal topic:

“I am not close to them [coaches]” (Netball), “Awkwardness with the coaches” (Netball), and “I think it takes a while for people [athletes] to be comfortable sharing something about their body, especially when you [athletes] don't know the person [coaches] well” (Golf)

The lack of mutual trust in the coach–athlete dyad may also lead to athletes feeling misunderstood, which then exacerbates their unwillingness to raise menstrual concerns

**TABLE 4** Menstrual cycle characteristics of postmenarcheal athletes not using oral contraceptive pills ( $n=82$ ).

Menstrual cycle characteristics	<i>n</i>	%
Gynecological age (years)		
Less than or equal to 3	44	53.7
More than 3	38	46.3
Number of periods in the last 12 months		
0–2	5	6.1
3–5	3	3.7
6–8	10	12.2
9–11	38	46.3
12 or more	26	31.7
Menstrual cycle length (days)		
Less than 21	8	9.8
21–35	56	68.3
35–45	15	18.3
More than 45	3	3.7
Period length (days)		
1–2	1	1.2
3–4	21	25.6
5–6	49	59.8
7–8	8	9.8
9 or more	3	3.7
Absence of period for at least 3 consecutive months		
Yes (history)	11	13.4
Yes (current)	2	2.4
No	69	84.1
Use of analgesics to relieve menstrual pain		
Yes	9	11.0
No	73	89.0

Abbreviation: *n*, number of athletes.

at training. Furthermore, these feelings likely stemmed from negative past experiences where athletes shared MC-related discomfort with their coach but were misunderstood or dismissed:

“My male coaches often feel that I am trying to slack my way out of training, so after a while I feel that I shouldn’t be telling them as it is futile” (Wushu), “When there is a lack of understanding, I can come off to be lazy or weak” (Shooting), “We would not want them to think just because of this [menstrual pain] we cannot train or we [are] using it [menstrual pain] as an excuse” (Badminton), and “Sometimes they don’t believe you, if you’re having your period they think you’re just trying to skip training” (Table Tennis)

*Lack of MC-specific education and communication pathways:* Some athletes felt that there were no channels (e.g., platform or personnel) put in place within the training environment to facilitate such conversations:

“No right situation or time to initiate a conversation” (Netball), “A little weird to bring it up out of nowhere” (Shooting), and “[talking about the MC] are usually not related to their job scope, especially for teachers and coaches” (Badminton)

In addition, some athletes also perceived that their coaches/support staff have limited knowledge of the MC to address their menstrual issues appropriately:

“[Coaches] have not been educated on this [the MC]” (Shooting), and “[Coaches] are not well educated [on the MC], or know how to act in these situations” (Badminton)

### 3.5.2 | Pervasive menstrual stigma

Most athletes made references to menstruation as a social taboo and that having conversations about it is not a norm within society:

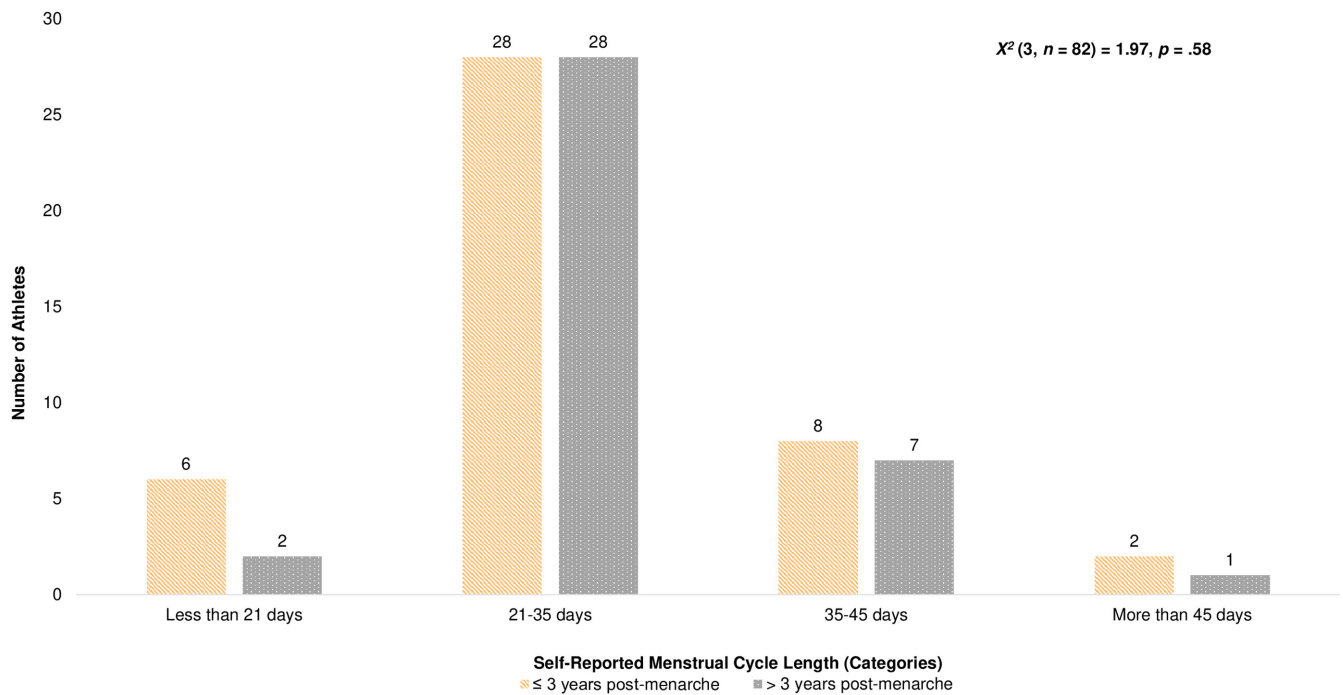
“It’s not been a topic of conversation in our society” (Track and Field), “Not well-discussed topic especially in Singapore” (Netball), and “Uncommon topic deemed as dirty” (Netball)

The menstrual stigma was also reinforced through the secrecy around menstruation, where many athletes viewed the MC as a personal issue that should be kept private:

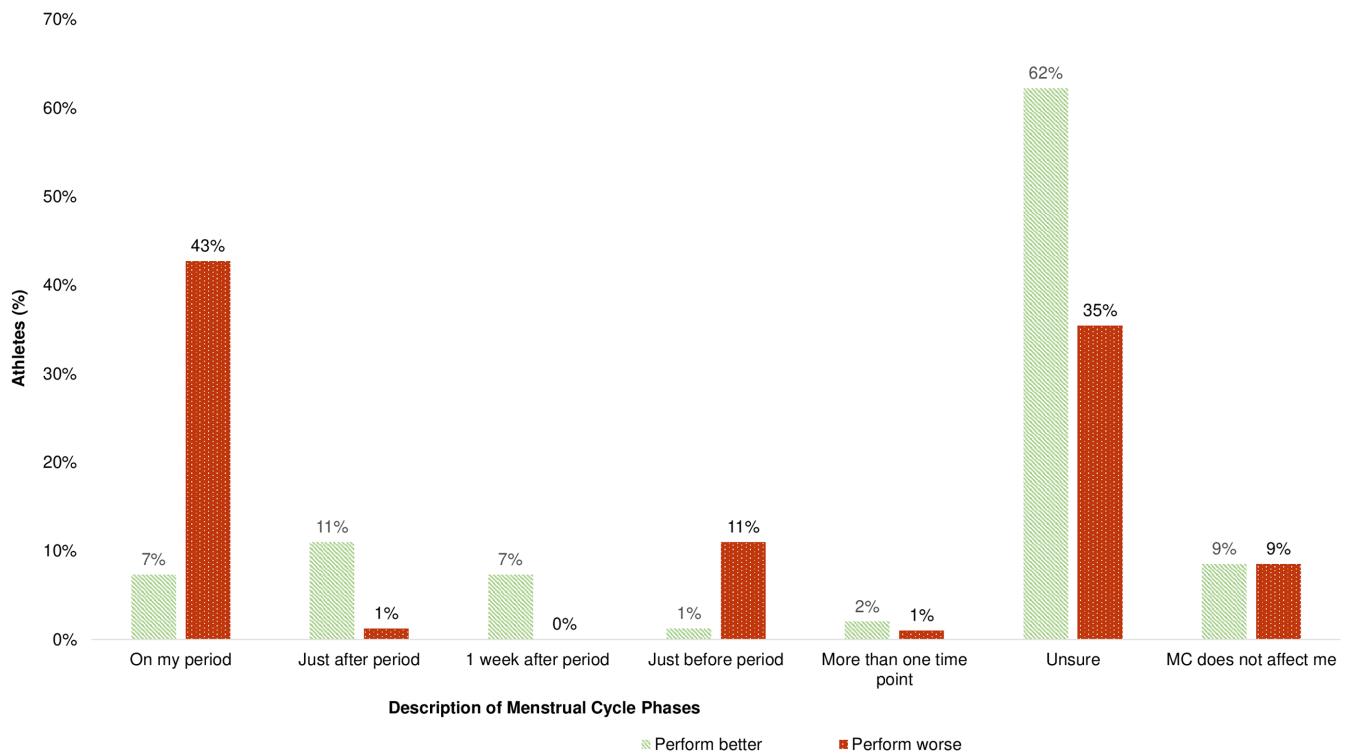
“I do not feel comfortable talking to [coaches] about such personal issues” (Netball), “It’s kind of like a personal thing that should be taken care of by yourself” (Ice/Speed Skating), and “MC isn’t something you usually talk to someone about and it’s personal” (Swimming)

This was associated with negative emotions such as feelings of embarrassment and awkwardness around the idea of having to talk about their MC:

“I feel embarrassed about my period even though I know it’s natural” (Bowling), “I am shy to talk about it” (Swimming), “It’s a bit



**FIGURE 1** Results of the chi-square test of independence indicating how gynecological age is distributed across self-reported menstrual cycle length.

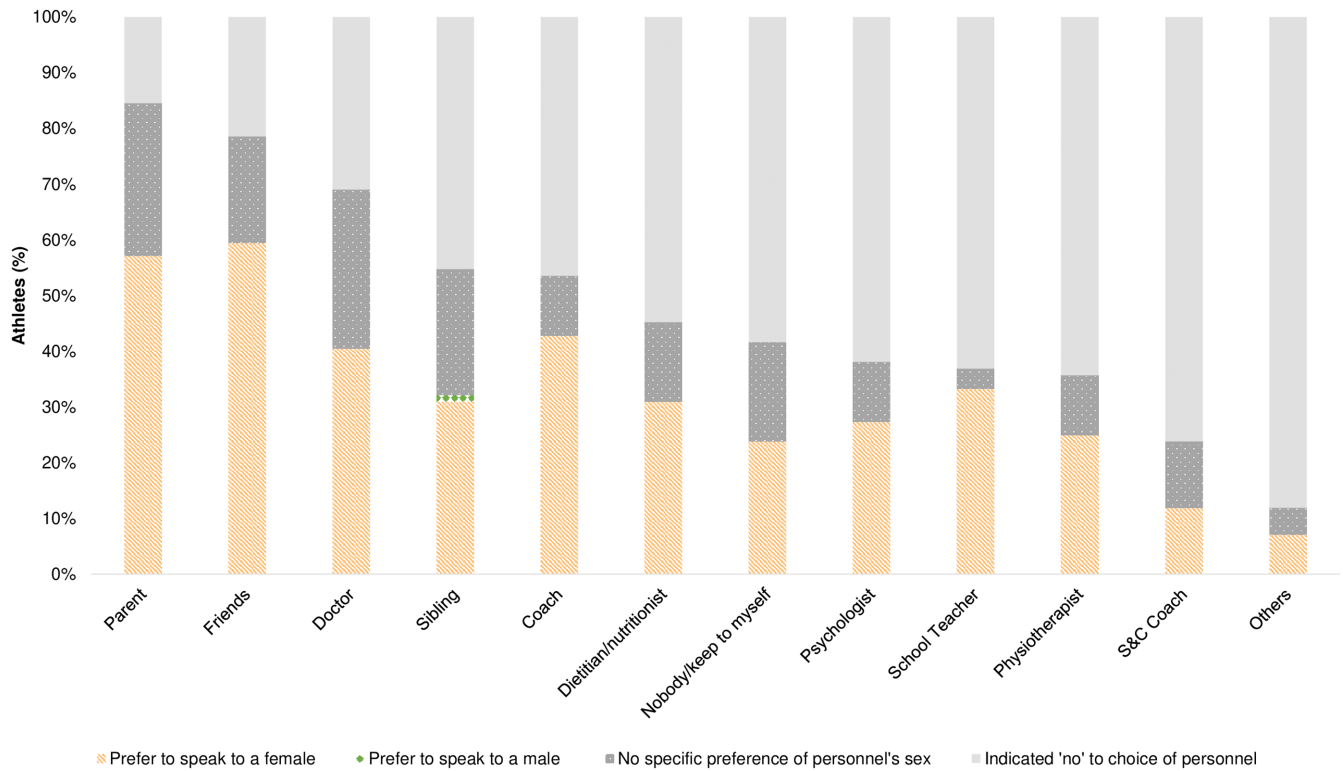


**FIGURE 2** Time points where postmenarcheal athletes (non-OCP;  $n = 82$ ) perceived “better” and “worse” performance across the menstrual cycle.

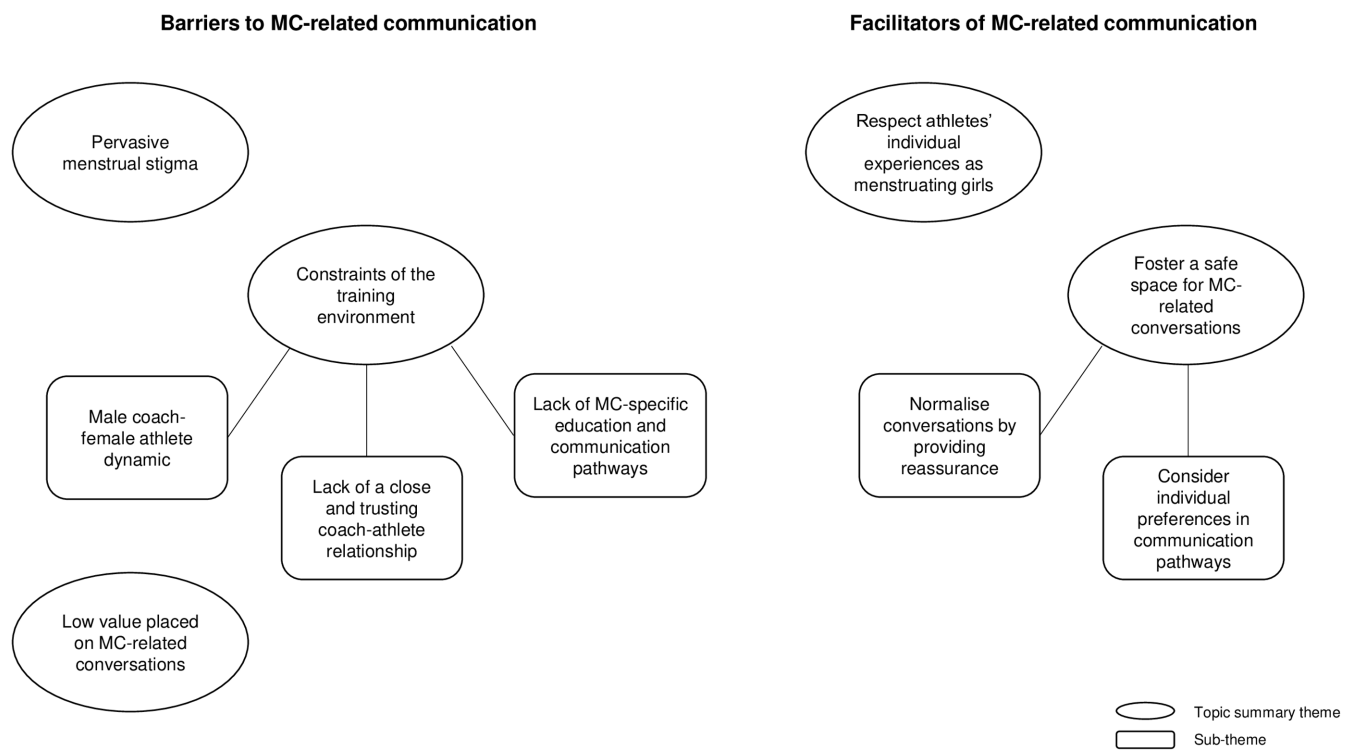
awkward to share/explain myself” (Shooting),  
 “No need to bring [up] the conversation just  
 for it to be awkward” (Netball)

Another negative emotion highlighted was the fear of  
 being judged by others if they brought up menstrual is-  
 sues or abnormalities:





**FIGURE 3** Postmenarcheal athletes' ( $n = 84$ ) preferred personnel and sex to speak to regarding their menstrual cycle. S&C, strength and conditioning.



**FIGURE 4** Thematic map highlighting overarching topic summary themes and subthemes.

“When I have tummy cramp, I may get judged” (Netball), “People might make some comments about it” (Netball), and “Fear of being scrutinised/judged for having an abnormal MC” (Shooting)

While it was clear that the menstrual stigma deterred many athletes from communicating about the MC, two athletes challenged the taboo and demonstrated that cultural attitudes to menstruation may be shifting:

“I think every woman faces menstruation and there is nothing weird about it” (Fencing), and “I believe there used to be a stigma with girls and their periods but I think in this day and age, more people are speaking up about their periods” (Shooting)

### 3.5.3 | Low value placed on MC-related conversations

Some athletes did not see the benefit or value of conversations about the MC for two main reasons. First, athletes who were not affected by their MC did not see the relevance of having such conversations:

“I just don’t see a need to talk about my MC with anyone since I don’t face any problems” (Bowling), and “Finding the need to talk about [the MC] [is difficult] since it does not impose any problems for me” (Netball)

The other group of athletes who were indifferent toward MC-related conversations demonstrated the normalization of MC-related discomforts (e.g., painful menstruation) as something that the athlete must accept and manage independently:

“All girls go through the same thing [MC] so it shouldn’t be an excuse for anything and it’s normal. So it’s more of like just deal with it” (Ice/Speed Skating), “Every female goes through the same thing [MC] so I see no use in it” (Netball), and “I don’t see a need to talk to any personnel as this is part and parcel of our lives” (Gymnastics)

## 3.6 | Facilitators of communication

Two overarching topic summary themes and two sub-themes describing how the training environment can be

changed to support conversations about the MC were constructed: (1) respect athletes’ individual experiences as menstruating girls and (2) create a safe space for conversations (Figure 4).

### 3.6.1 | Respect athletes’ individual experiences as menstruating girls

Athletes highlighted the need for practitioners to respect their individual experiences as menstruating girls by demonstrating an expectation or desire for coaches to be more accepting and empathetic toward their menstrual pain or negative MC-related symptoms. Specifically, athletes highlighted that coaches should not dismiss their pain and/or view it as an excuse to get out of a training session:

“Coaches can be more open and understanding to girls like myself who suffer from severe period cramps. Instead of dismissing them as weak or having poor pain endurance” (Wushu), “especially when they are having cramps and they cannot train they should not be judged for giving period cramps as a reason” (Bowling), “Be more understanding about us because only we know our body and what we are feeling and our PMS [premenstrual symptoms]” (Table Tennis), and “Coaches be understanding, don’t think of it as excuse” (Badminton)

In addition, athletes also called for coaches to make appropriate training adjustments or allowances if they are suffering from MC-related pain or discomfort:

“Lighter training loads so it’s less stressful for us to deal [with]” (Fencing), “Give us the option of skipping training on certain days as each person has different intensity of pain tolerance” (Fencing), “sometimes we need a break because of cramps or feeling unwell” (Netball), “they should allow girls to sit out until they feel better” (Wushu), and “when they are having cramps and they cannot train, they should not be judged for giving period cramps as a reason” (Bowling)

### 3.6.2 | Foster a safe space for MC-related conversations

Two subthemes were subsumed under the overarching topic summary of fostering a safe space for MC-related

conversations: (1) normalize conversations by providing reassurance and (2) consider individual preferences in communication pathways.

*Normalize conversations by providing reassurance:* Athletes demonstrated an openness to engage in more frequent MC-related conversations while seeking some form of reassurance that it was acceptable to do so within the training environment:

“Be brought up regularly so it’ll be normal to discuss in the future” (Netball), “This topic could be addressed more often to make it comfortable” (Netball), “Just reassure us that it is fine to open up with this topic” (Pencak Silat), “Maybe some reassurance that it’s okay to talk about it” (Shooting), and “coach remind us that it’s okay to share what we want to” (Netball)

*Consider individual preferences in communication pathways:* Many athletes raised the need for structured communication pathways to be implemented, but had contrasting views about their preferred communication setting (i.e., individual vs. group settings) and who to initiate conversations about the MC (i.e., athlete- vs. coach-initiated). The athletes who preferred to engage in one-on-one conversations with their coach valued privacy and sensitivity around the topic:

“Privately with coach” (Swimming), “Not many people are around” (Netball), and “When there’s nobody watching” (Netball)

Conversely, athletes who preferred group/team-based conversations about the MC demonstrated a sense of connectedness and social support from their teammates, indicating that a group-based setting can cushion the negative feelings associated with the menstrual stigma:

“Discussing it in small groups of 2 to 4 people so that I don’t feel alone” (Golf), “Group sessions with my support staff and other girls (if they are comfortable) where we can have like a check-in and discuss about the MC” (Ice/Speed Skating), “Coach should talk about this to everyone and not privately so it would be less awkward” (Gymnastics)

While one athlete responded that athletes should approach coach/support staff, most athletes preferred for their coach/support staff to initiate conversations about the MC, rather than for the athletes to approach them:

“Have the staff initiate discussions” (Netball), “Instead of waiting for the athlete to speak up” (Shooting), and “When my coach asks what’s wrong with me and I explain myself” (Shooting)

While these athletes appeared to be open to communicating about the MC with their coaches/support staff, two athletes highlighted the need to set boundaries in these conversations and not probe beyond what athletes are comfortable with:

“He [coach] just says okay and just accepts it rather than trying to find out more about it and question more” (Shooting), and “as long as they do not get into too much detail” (Shooting)

Some athletes mentioned that having a female figure to approach regarding the MC would make communication easier, further reinforcing “females” as the preferred sex that most athletes were more comfortable speaking to (Figure 3).

## 4 | DISCUSSION

The objectives of this study were to examine the MC characteristics, explore the perceived impacts on sport training and performance, and identify barriers to and facilitators of MC-related communication among high-performance female adolescent athletes in Singapore. To our knowledge, this is the first study to explore the MC characteristics and lived experiences of adolescent athletes in a Southeast Asian country like Singapore.

### 4.1 | Menstrual cycle characteristics

It is well established that athletes tend to attain menarche significantly later than nonathletes, especially if the initiation of intense physical training or competition began before puberty.<sup>18</sup> This is likely a result of an altered hypothalamic–pituitary–ovarian (HPO) axis function from being in a state of LEA (i.e., inadequate energy intake to match energy demands).<sup>19</sup> In adolescent athletes, the estimation of energy needs is often complicated by the substrate demands for growth and maturation, in addition to the energy demands associated with training and competition. Interestingly, the mean age of menarche observed in our study ( $11.9 \pm 1.3$  years) is comparable to the global average of 12 years old<sup>20</sup> and earlier than previously

reported age of menarche in athletes (13 to 14 years).<sup>3,8</sup> Our findings are similar to that of young female judo athletes with an average menarcheal age of  $11.8 \pm 1.2$  years,<sup>21</sup> suggesting that the lower age of menarche in both studies could be attributed to the general declining trend of menarcheal age observed in many developing and developed countries as a result of improved nutrition and better socioeconomic status.<sup>22</sup> While most athletes attained menarche before the age of 15 years, there were still cases of primary amenorrhea within the sport of gymnastics. This is unsurprising as athletes from leanness/aesthetic sports tend to have a higher incidence of menstrual dysfunction compared with nonleanness sports,<sup>23</sup> with menarche reported to be delayed by 1.5 to 2 years in elite rhythmic gymnasts compared with normal controls.<sup>24</sup> Considering this, another plausible reason for the low prevalence of primary amenorrhea within the present sample was that 90% of athletes were from nonleanness/weight-category sports.

While most non-OCP athletes in the present study were naturally menstruating, approximately one in five athletes self-reported longer cycle lengths of greater than 35 days, including cases of self-reported current secondary amenorrhea (i.e., the absence of at least three consecutive periods in nonpregnant females with past menstruation<sup>16</sup>). As oligomenorrhea (i.e., MC lengths greater than 35 days<sup>16</sup>) lies on the continuum of MC disorders and can progress to functional hypothalamic amenorrhea (i.e., secondary amenorrhea),<sup>25</sup> the condition can be concerning in adult athletes. However, due to the immaturity of the HPO axis during the initial years following menarche, irregular and long cycle lengths of between 21 and 45 days can be expected in adolescents up to 3 years postmenarche.<sup>26</sup> Nonetheless, it is crucial to recognize that during the initial postmenarcheal years, cycle lengths in adolescents do not typically exceed 45 days and a prolonged absence of menstruation could be indicative of a state of LEA or underlying clinical conditions which should warrant further investigation.<sup>27</sup> While this study showed no statistically significant association between gynecological age and cycle length, eight non-OCP athletes who were at least 3 years postmenarche at the time of the study self-reported cycle lengths that were greater than 35 days, including one athlete who reported cycle lengths that were greater than 45 days. Considering the consequences that hypoestrogenism associated with menstrual disturbances have on growth velocity and peak bone mass acquisition during adolescence,<sup>6</sup> it would be beneficial for these athletes to be flagged for medical review and continued surveillance.

While a low prevalence of primary amenorrhea was observed in this sample, 16% of athletes reported a current/history of secondary amenorrhea. This could be attributed

to an increase in sport stressors (e.g., higher training load and competition level) and nonsport stressors (e.g., academic load) during adolescence and underpinned by a state of LEA where energy intake is insufficient to match the competing energy demands of sport and maturation. Furthermore, among the athletes who reported a history of secondary amenorrhea, almost half reported having current cycle lengths of greater than 35 days and were from a mix of leanness/nonleanness sports. Taken together, these observations highlighted that regardless of sport, “losing periods” seems to be common in adolescent athletes. Given the potentially deleterious effects of menstrual dysfunction on skeletal health, there is a crucial need to ensure that ongoing prevention/surveillance programs and appropriate management of menstrual irregularities within the adolescent training environment are available.

Only two out of 84 postmenarcheal athletes reported using OCP, which is significantly lower than the prevalence of OCP use reported in previous studies on elite adult athletes (17%–57%).<sup>2,3,28</sup> The lower rate of OCP use in our sample of adolescent athletes as compared to adults is consistent with that of the general population, where adolescents aged 15 to 19 years old reported the lowest rates of contraceptive use among women of reproductive age.<sup>29</sup> Furthermore, one of the OCP users who was diagnosed with PCOS reported that the use of OCP was recommended by a doctor/endocrinologist to control/regulate her cycles. Apart from age and medical considerations, cultural and contextual factors (e.g., prevailing laws and policies that may impact access to contraceptives) may also influence the acceptance and use of contraceptives. Notably, Singapore reported the lowest prevalence of contraceptive use (39%) among countries such as the United Kingdom (72%), the United States (61%), and Australia (57%).<sup>30</sup> To that end, the younger age group in a different cultural context may explain the significantly lower prevalence of OCP use in this sample as compared to adult athletes. This highlights the value of replicating prevalence studies across different countries and contexts. From a practical perspective, the lower acceptance and adoption of OCP use in such contexts (e.g., cultural factors and young age) may have implications on the provision of support for athletes around menstrual health. Specifically, it is of utmost importance that practitioners and medical personnel recognize and respect that the use of OCPs to alleviate symptoms of dysmenorrhea may not be a desirable management option for these athletes. Considering this, practitioners and medical personnel should work with the affected athletes (e.g., with dysmenorrhea) to explore other coping strategies available to them such as pharmacological and/or nonpharmacological interventions.

## 4.2 | Perceived impact of MC on performance

More than 60% of adolescent athletes in this study perceived that their MC affected their ability to train and compete. This finding is consistent with previous studies,<sup>2,3,8</sup> demonstrating that despite a lack of consensus on the effect of the MC phases on physical performance outcomes,<sup>1</sup> a large proportion of senior and junior athletes perceive that the MC affects their performance. Interestingly, adolescent athletes in this study were slightly more likely (67% vs. 62%) to be affected by their MC during competition than in training. This is in contrast to Australian Olympic/Paralympic athletes and international rugby players who reported that they were more affected during training than in competition,<sup>2,8</sup> suggesting that the competition situation (e.g., higher stakes and greater attentional focus) may override the negative interference of symptoms. Plausible reasons for the contrasting observation in our study include the younger age, lower competitive level, and inexperience of adolescent athletes. Research suggests that due to their inexperience, younger athletes have a smaller coping repertoire and are less prepared to cope with adversities compared with adults.<sup>31</sup> For example, elite adult athletes have acknowledged that fears of menstrual leaking may be increased during high-pressure competition situation.<sup>8</sup> However, this worry of leaking may be heightened in adolescent girls who may experience even higher levels of shame if menstrual flooding occurred.<sup>32</sup> Additionally, the level of competition in this study is much lower than previously cited studies that involved international elite athletes,<sup>2,8</sup> with only 19% of the current sample competing at regional and international levels. Therefore, while adult athletes competing at higher levels may be more likely to adapt and overcome the distraction of negative MC-related symptoms during competition, adolescents may instead perceive them as stressors. Interestingly, none of the athletes reported having to withdraw from competition in the past year because of negative MC-related symptoms. This may suggest that while adolescent athletes may be less able to cope with the distraction of negative MC-related symptoms, they are still likely to endure and compete through the symptoms given the higher stakes involved in competition.

While more than half of athletes could identify a time point across the MC where they perceived that their performance was “worse,” only 28% managed to identify a time point where they felt that they performed “better.” This was also observed in a previous study,<sup>3</sup> where most athletes could indicate a specific phase when their physical fitness was “worse” (71%), but only half could identify

when their physical fitness might be “better.” Taken together, these findings seem to demonstrate that athletes may have a negative bias toward the MC as a barrier to performance. This is not surprising given how society has constructed the MC and, specifically, menstruation as a negative occurrence. Indeed, conversations about the MC often focus on negative experiences such as pain, inconvenience, and discomfort before and during menstruation, without considering positive aspects that may emerge across the entirety of the MC.<sup>33</sup> While there is indeed a physiological basis for negative MC-related symptoms that may result in underperformance and its burden should not be downplayed, perhaps the existing negative social constructs need to be reframed to avoid shaping or reinforcing the MC as a barrier to athletic success.

In athletes who identified a time point across the MC where they performed “worse,” most felt that they performed “worse” on their period/menstruating and some indicated just before their period. This is consistent with previous findings<sup>3,34</sup> and is likely associated with the occurrence of a myriad of negative MC-related symptoms during these two phases as endogenous estrogen and progesterone concentrations decline significantly. Additionally, the perceived performance decrements during menstruation could also be a result of the social pressures around menstruation. Given the social intolerance of visible menstrual blood, the fear of menstrual leaking and the threat of humiliation, if it occurs, might be a performance distraction during menstruation and may be further accentuated if athletes are required to wear certain sports attire/uniforms such as white shorts or leotards. These may pose additional stressors to younger female athletes who may have a lesser understanding of the types of period products and how to use them during their initial post-menarcheal years. It is also important to recognize that while using a tampon or menstrual cup under a swimsuit or leotard might sound instinctive for some, cultural barriers do exist and the use of tampons has not yet been widely accepted by women in some conservative Asian cultures primarily due to cultural myths (e.g., tampons may break the hymen).<sup>35</sup> Taken together, the interference of negative MC-related symptoms and the sociocultural pressures of menstruation are both plausible contributors to a perceived reduction in sports performance during menstruation.

In contrast, there was more variation in the time points that athletes felt they performed “better,” with some athletes reporting that they performed “better” while on their period. These findings highlight that the effects of the MC on perceived performance are highly individualized and further reiterate current perspectives that a personalized approach should be taken based on each individual's training response across the MC.<sup>1</sup>

### 4.3 | Barriers to and facilitators of communication

The open-ended responses to the questionnaire revealed several barriers to and facilitators of MC-related communication that were largely complementary. One of the key barriers to communication that may underpin the general lack of conversations about the MC is the societal stigma that menstruation is shrouded in. Athletes in this study described talking about the MC as inappropriate and unacceptable within the norms of society and the sporting environment. Athletes also reported feelings of embarrassment and fears of judgment around the idea of talking about their MC with someone. This is likely a result of the deep-seated cultural and religious taboos on menstruation, which may continue to persist in a multiracial and multireligious country like Singapore. Notably, the consistent theme across some of these cultures and religions in a Southeast Asian context is the notion of menstruation being dirty or impure (e.g., menstruating women being prohibited from places of worship or not being allowed to prepare certain dishes while menstruating).<sup>13</sup> Considering this, it is unsurprising that females are often socialized into concealing their menstruation or MC-related issues from a young age. While the secrecy and shame around menstruation transcend age, the negative expectations and shame may be heightened in adolescents as they may experience greater self-consciousness in the process of negotiating their identities during adolescence.<sup>36</sup> Moreover, they may express a desire to “fit in” and gain peer acceptance by conforming to social norms, which in this context may refer to the avoidance of MC-related conversations. While cultural attitudes and discourses around the MC seem to be changing, it is apparent that more needs to be done to destigmatize menstruation, especially among adolescent girls. Interestingly, some athletes demonstrated that having more frequent MC-related discussions while reassuring them that it was acceptable to do so within the sporting context could contribute to reducing the perception of awkwardness and discomfort surrounding the topic. The seemingly paradoxical perspectives may suggest that while adolescent athletes may struggle with MC-related discussions, they still express a desire for a safe space to be fostered within the training environment for more open discussions about the MC to occur.

Within the sporting context, a lack of a close and trusting coach–athlete relationship (regardless of coach gender) was likely to influence athletes' willingness to talk about the MC in this study. Specifically, several athletes described that they were not “close enough” to their coaches, and while the concept of “closeness” is used broadly here,

it could be assumed to reflect the degree of emotional connection in the coach–athlete dyad and associated with relational properties such as mutual trust and respect.<sup>37</sup> To that end, a perceived lack of mutual trust by the athlete is likely to steer athletes away from engaging in discussions about the MC, which they may deem as a sensitive matter. Furthermore, it is likely that such perceptions were partly driven by negative past experiences, where athletes had raised the topic (e.g., struggling with menstrual pain) during training but were dismissed by their coaches as a weakness or an excuse to get out of training. In relation to that, many athletes alluded to the need for coaches to be considerate of and respect their individual experiences as menstruating girls. Specifically, athletes demonstrated a desire for coaches to be more empathetic toward their situation (e.g., menstrual pain) rather than downplay or dismiss their experiences. While negative responses from coaches could be attributed to their distrust toward the athletes, in this context it is more likely to be a result of having no lived experiences (in male coaches) and/or a lack of knowledge about the MC.<sup>10</sup> Indeed, coach education often overlooks female athlete-specific considerations such as the MC, as compared to other areas of sports science.

Another constraint within the training environments of adolescent female athletes that prevented athletes from talking about the MC was being in a male-dominated environment and/or being coached by men. This perceived gender barrier to MC-related communication was also reported in previous studies.<sup>8,10,34</sup> While the reluctance and/or perceived discomfort in talking to male coaches about the MC is likely to be primarily driven by how menstruation is framed as a process that should be kept private, particularly from boys and men, it could also be attributed to other aspects of gender and power relations underpinning the male coach–female athlete dyad. For example, previous research has found that expectations of traditional gender roles (e.g., men as authoritative and women as empathic) may be reinforced in a male coach–female athlete dynamic.<sup>38</sup> Such expectations were observed in this study, where some athletes perceived that engaging in MC-related conversations would make their male coaches feel uncomfortable and therefore chose to avoid such conversations. The reluctance to discuss this topic with a male coach may also be more pronounced during adolescence as cognitive, social, and emotional capacities have yet to be fully developed.<sup>39</sup> Indeed, previous research highlighted that athletes felt that it was easier to talk about menstrual issues as senior athletes compared to when they were younger.<sup>8,10</sup> It is apparent that increasing open communication about the MC while prioritizing the safety of young female athletes in relation to safeguarding concerns can be challenging in an adolescent sporting

environment. While further educational opportunities for male coaches (and all those working with female athletes) should certainly be prioritized, the adolescent athletes' clear preference for a female figure to approach regarding this topic should be acknowledged and is one of many justifications for sporting organizations to ensure adequate female representation among coaching and performance staff.

A lack of structured MC-specific communication pathways was another constraint of the training environment, whereby athletes were unsure of when and with whom to initiate a conversation about their MC-related concerns. The need for structured communication pathways to be established within the training environment was also highlighted by a previous study,<sup>10</sup> suggesting that organized discussions on menstrual health within sport could still be a relatively unfamiliar concept. The varied preferences indicated by athletes concerning the communication setting also demonstrate that there is unlikely a "one-size-fits-all" approach to address this topic in adolescent athletes and practitioners need to consider individual comfort and preferences when engaging in these discussions. Despite contrasting views, there was a consensus among athletes that the coach/support staff should initiate the topic, indicating that athletes may perceive the normalization of MC-related discussions at training to be a top-down initiative. While there is a call to normalize conversations about the MC, it is crucial to recognize that young female athletes may remain uncomfortable in highlighting their MC-related concerns within the sporting environment. Specifically, as most athletes in this study indicated a clear preference to discuss their MC with immediate family (e.g., parents/siblings) rather than with support staff within sport, the involvement of parents in both education and communication pathways should not be overlooked when working with adolescent athletes.

Another barrier to communication constructed in this study was that some athletes placed a low value on MC-related conversations. A few athletes felt that there was no need for them to engage in MC-related discussions as their individual MC did not affect them, suggesting that while negative menstrual symptoms are a common occurrence among menstruating females, their severity and impact on individuals vary. From an applied perspective, practitioners need to avoid a negative bias and recognize the possibility that some athletes may not be bothered by their MC. In other words, if eumenorrhea has been established in these athletes who are unaffected by their MC, further MC-related discussions may be irrelevant and deemed burdensome given the multitude of other considerations that athletes must manage within high-performance environments. Some athletes did not see the relevance in MC-related discussions as they displayed an acceptance

of their negative symptoms as "normal" and something to be endured. A similar perception was held in Findlay et al.,<sup>8</sup> where some international rugby players did not view MC issues as acceptable reasons to be excused from training and that menstrual concerns are not justifiable medical issues. This is unsurprising as athletes, especially those training and competing at the highest levels need to be able to perform consistently throughout their MC. Nonetheless, the potential adverse health consequences of normalizing MC-related pain (e.g., poor pain management and delayed diagnosis of underlying disorders such as endometriosis) cannot be disregarded. Interestingly, some athletes in this study thought otherwise and wanted coaches to make training adjustments and allowances for those affected by MC-related pain and discomfort. Taken together, the trivialization and mismanagement of MC-related issues seem to reflect the lack of knowledge on female athlete health among athletes at both junior and senior levels.<sup>8,10,34</sup> Specifically, there appears to be inadequate awareness of symptom mitigation strategies and athletes do not necessarily need to bear with and train through MC-related pain and discomfort. Indeed, despite pain being the most common MC-related symptom reported in this study, the use of analgesics to reduce menstrual pain was low. To that end, athlete educational initiatives to increase menstrual health literacy should be introduced. Moreover, limited knowledge on menstrual health was identified to inhibit athletes from initiating discussions,<sup>10</sup> while improved knowledge may encourage athletes to talk more openly about the MC.<sup>34</sup> Several studies also described the importance of menstrual health education for younger athletes,<sup>10,34</sup> where adult athletes highlighted that they would be more likely to communicate menstrual concerns earlier in their sporting careers if they were more knowledgeable about female athlete health as adolescent athletes.<sup>10</sup> From a sociocultural perspective, educating younger athletes and starting the conversation even prior to or approximating menarche may also tackle the menstrual stigma before any misinformation or negative perceptions (e.g., MC as a barrier to athletic success) are firmly established.

#### 4.4 | Practical applications

Screening for menarche should be undertaken from pre-adolescence and athletes who fail to reach menarche by age 15 years when the development of secondary sexual characteristics (e.g., breasts) is evident should be flagged for further investigations. Postmenarcheal female athletes should also undergo periodic screening for MC-related discomfort and/or disorders, and clear support pathways for appropriate management (e.g., diagnoses and treatment)

should be established within the training environment to minimize any health or performance decrements. This screening approach should be subsumed under a structured communication pathway concerning menstrual health within the training environment. The communication pathway should consider individual preferences (e.g., platform/setting, personnel, and maturity) and establish a known point of contact (e.g., preferably a female figure for adolescent girls) for adolescent athletes to raise their menstrual concerns. To facilitate communication about the MC, it is paramount that coaches/support staff are well-equipped with the relevant knowledge. Therefore, coach education should include the MC and other female athlete-specific considerations, with a focus on enhancing the coach/support staff's confidence and comfort to communicate with their athlete about the MC in a sensitive and age-appropriate manner. Similarly, to empower adolescent athletes to raise menstrual concerns (if any) and increase self-awareness toward their MC, athletes should be educated on MC-related topics such as menstrual health literacy (e.g., what to expect, what is normal, and symptom mitigation). From a broader perspective, menstrual education should constitute an essential aspect of schools' health education curricula. Nonetheless, sport can also be used as a leverage point to educate and/or reinforce fundamental knowledge about the MC within the sporting context (e.g., the importance of fueling and fears of menstrual leaking). Athlete education in this area should ideally begin from preadolescence and education materials should be age-appropriate (e.g., consider differences in physiology, lived experiences, and maturity levels between adults and adolescents). Enhancing knowledge about the MC, particularly in younger athletes may be beneficial in their longer-term athletic careers. Lastly, as parents play an active role in the career of athletes during adolescence and were further identified by athletes in this sample as the preferred role to raise menstrual concerns, it would be imperative to include parents within these pathways.

#### 4.5 | Limitations

Several limitations of the study should be considered. First, while the study sample consisted of athletes across 14 different sports, 90% of these athletes were from non-leanness/aesthetic and nonweight-category sports. Considering that athletes competing in sports that emphasize leanness, aesthetics and/or a weight class may be at higher risk of menstrual disturbances,<sup>40</sup> the present findings may underestimate the prevalence of menstrual disturbances in adolescent athletes participating in these sports. The questionnaire used in this study was adapted from previously used questionnaires and was not validated;

however, to minimize measurement error, the questionnaire was piloted with a smaller group of athletes from the same sports academy. The limitations of using a retrospective self-report questionnaire such as recall (e.g., recall of data on menarcheal age), social desirability, and response bias are acknowledged. As compared to interviews, open-ended questions used in this study were not able to elicit in-depth lived experiences and unclear responses could not be clarified. The absence of a coach's perspective about aspects of communication is a limitation considering the intricacies involved in the coach-athlete dyad.

## 5 | PERSPECTIVE

This study was the first to examine aspects of the MC relating to performance and communication in high-performance adolescent athletes within a Southeast Asian context. The findings suggest that cycle length disturbances are common in adolescent athletes, with perceived negative impacts of their MC on performance similar to that previously reported in adult athletes.<sup>2,3,8</sup> To minimize health and performance decrements, periodic screening for MC-related discomfort and/or disorders should be undertaken, and symptom mitigation strategies should be explored. The barriers that prevented athletes from communicating about the MC were the menstrual stigma, the constraints of the training environment, and the irrelevance of such conversations for some athletes. To overcome these, there should be greater regard for young female athletes' individual experiences and a safe space for MC-related conversations to occur within the training environment should be fostered. It is important to recognize that as the MC, lived experiences, and openness to MC-related conversations are highly individualized, there is unlikely a "one-size-fits-all" approach to the topic and MC-related initiatives in youth sport should ideally be age-appropriate, account for individual preferences, and involve parental support. Future research should focus on developing educational interventions for the adolescent athletic population and explore communication strategies to promote an environment of open discussion about this topic in adolescent sport.

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### CONFLICT OF INTEREST STATEMENT

Bernadette Cherianne Taim, Jamie Lye, Haresh T. Suppiah, Chan Tin Wing, Michael Chia, and Anthea Clarke declare that they have no conflict of interest.



## DATA AVAILABILITY STATEMENT


Research data are not shared.

## ORCID

Bernadette Cherianne Taim  <https://orcid.org/0000-0003-3565-1869>

Jamie Lye  <https://orcid.org/0000-0002-0183-2904>

Haresh T. Suppiah  <https://orcid.org/0000-0001-9828-2349>

Tin Wing Chan  <https://orcid.org/0000-0002-6858-0115>

Michael Chia  <https://orcid.org/0000-0002-1289-0552>

Anthea Clarke  <https://orcid.org/0000-0001-6561-2460>

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