

# Menstrual Cycle and Hormonal Contraceptive Symptom Severity and Frequency in Athletic Females

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The purpose of this study was to determine symptom severity and frequency in female exercisers and athletes from a diverse range of sports who have a menstrual cycle (MC) or use hormonal contraceptives (HCs). An additional aim was to explore the perceived impact of MC/HC use upon exercise and sport performance. In total, 604 self-identifying female athletes and exercisers ( $M = 29.4$  years,  $SD = 9.0$ ) from 85 sports/activities completed a survey which included: sport/exercise participation, bleeding characteristics, HC use, symptom severity/frequency, symptom management strategies, menstrual product use, and perceived impact of MC/HC use on exercise performance. The data were subject to mixed-methods analysis. Over one third ( $n = 225$ ; 37.25%) of participants reported current HC use. Ninety-five percent (95.36%) of participants experienced symptoms related to MC or HC use. Physiological, psychological, and affective symptoms were all among the most prevalent. The most frequently noted severe and very severe symptoms for all participants, MC and HC users, were abdominal cramps (36.92%, 39.32%, and 32.89%, respectively), mood changes (26.16%, 25.07%, and 28.00%, respectively), and tiredness (25.33%, 25.59%, and 24.89%, respectively). Symptom impact was self-managed through medical and/or other (cognitive/behavioral) strategies. Qualitative content analysis of the data produced four overarching themes: (a) the impact of symptoms, (b) menstrual stigma and taboos, (c) protective factors, and (d) coping strategies. In conclusion, menstruation is a multifaceted, unique experience that impacts upon sport/exercise performance. Practitioners should consider athletes' distinct needs, including the frequency of occurrence and severity of their symptomatic experiences, when facilitating menstruation-supportive training, avoiding a "one-size fits-all" approach.

**Keywords:** sport, endocrine, questionnaire, stigma

## Key Points

- Most (95.4%) exercisers and athletes experienced menstrual cycle (MC)-related symptoms.
- The prevalence of severe and very severe symptoms across a diverse global athletic population was noteworthy.
- Qualitative responses from a large cohort of athletes and exercisers highlighted experiences related to menstrual stigma and taboo, the psychological impacts of symptoms, coping strategies used, and positive experiences toward menstruation.


The menstrual cycle (MC) is characterized by cyclical fluctuations in endogenous female sex hormones, with a mean cycle length typically lasting 28–29 days (Bull et al., 2019; Fehring et al., 2006; Li et al., 2020). Estrogen and progesterone, the main female ovarian hormones, are thought to influence a plethora of physiological,

psychological, and behavioral responses which can potentially impact sport and exercise performance (Blagrove et al., 2020; Bruinvels et al., 2016; 2021; Brown et al., 2021; de Jonge, 2003; McNulty et al., 2020). Historically, research concerning menstruation within a sport and exercise context has predominantly focused on the biological or physiological responses or processes, with the personal and lived experiences being largely neglected until recently (Brown et al., 2021; Bruinvels et al., 2022; Findlay et al., 2020; Kolic et al., 2022).

MC-related symptoms are commonplace within athletic populations, with between 51% and 93% of female athletes self-reporting negative physical, psychological, and affective symptoms (Brown et al., 2021; Bruinvels et al., 2016, 2021; Findlay et al., 2020; Kishali et al., 2006). A recent study of 6,812 exercising women reported regularly experiencing an average of 11 MC-related symptoms, including "mood changes/anxiety, stomach cramps and increased fatigue" (Bruinvels et al., 2021). Athletes also experience and report menstrual dysfunction and irregularities. For example, between 13% and 53% of athletes self-report heavy menstrual bleeding (Armour et al., 2020; Bruinvels et al., 2016; Findlay et al., 2020; Vannuccini et al., 2020).

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While there have been positive increases in MC and hormonal contraceptive (HC) research in the context of sport, along with important strides being made in categorizing female athlete/exercisers MC and HC users symptom prevalence (Bruinvels et al., 2021; Nolan et al., 2022; Parker et al., 2021), specific understanding of symptomatic experiences, especially symptom severity, remains somewhat lacking. Severity of symptoms is negatively associated with quality of life and adversely impacts activities of daily life in the general population (Lacovides et al., 2014); however, less is known about MC/HC symptom severity in female exercisers or athletes. One recent study by McNulty et al. (2024) aimed to examine the type, frequency, and severity of symptoms experienced by 42 recreationally active women who had a natural MC, or used a combined, monophasic oral HC. Frequency and severity of symptoms were associated with perceived longer posttraining recovery times and perceived reduction in exercise performance, with no differences in MC symptomology between HC users and those with a natural MC (McNulty et al., 2024). While McNulty et al. (2024) shed light on symptom severity in recreationally active women, it is important we deepen our understanding with respect to MC and HC users symptom severity in exercisers and athletes with larger population sizes.

Negative MC-related symptoms and dysfunctions have been shown to perceptually impact training and competition performance (Armour et al., 2020; Brown et al., 2021; Bruinvels et al., 2016, 2021; Findlay et al., 2020). For example, nearly 42% of runners believed their MC negatively impacted their performance ability (Bruinvels et al., 2016), while 83% of amateur footballers reported that the menstruation limited performance to some extent (Pinel et al., 2022). A few studies have explored the impact of the MC on sporting performance using in-depth narratives (e.g., Brown et al., 2021; Caballero-Guzmán & Lafaurie-Villamil, 2020; Findlay et al., 2020). For example, swimmers reported feeling slower/heavier during menses (Caballero-Guzmán & Lafaurie-Villamil, 2020), and elite rugby players often felt that their attentional focus on the sporting task was reduced while menstruating (Findlay et al., 2020). While these in-depth narratives are essential to understanding athlete experiences, they are limited by the small cohort sizes subject to investigation. Thus, there is a need to explore the impact of the MC on a larger cohort of varying exercising and athletic backgrounds.

Although exercisers and athletes have a high prevalence of symptoms and often report these symptoms as negatively impacting training and competition, they do not always seek medical support for MC symptoms. Instead, they typically attempt to self-manage symptoms via pharmaceutical, hormonal, and behavioral strategies (Armour et al., 2020; Brown et al., 2021; Findlay et al., 2020; Modena et al., 2022). Pain medication (e.g., simple analgesics, nonsteroidal anti-inflammatories) is the most common method of managing dysmenorrhea and other MC symptoms. In addition, HCs are sometimes prescribed to reduce the perceived impact of MC symptoms on sporting performance (Clarke et al., 2021; Martin et al., 2018). The prevalence of HC use in athletes varies between 10% and 51% (Clarke et al., 2021; Martin et al., 2018; Modena et al., 2022; Nolan et al., 2022; Parker et al., 2021). Athletes using HCs have reported therapeutic benefits, such as reduced bleeding (Clarke et al., 2021; Martin et al., 2018; Nolan et al., 2022). However, fewer studies have reported the prevalence of different symptoms in HC users, such as mood changes (Armour et al., 2020; Martin et al., 2018; Nolan et al., 2022), and again, there are no studies that have investigated the symptom severity in exercisers and athletes that use HC.

Therefore, the aims of this research were to determine the comparative symptom severity and frequency in females with an MC and those who use HC in a sample of exercisers and athletes from a diverse range of sports, and HC users, in a sample of exercisers and athletes from a diverse range of sports. An additional aim was to explore the perceived impact of menstruation on exercise and sports performance. In doing so, the findings provide a novel understanding that may inform existing support structures for menstruating and HC-using athletes across sports and competitive levels.

## Method

### Participants

Self-identifying adult female athletes and exercisers ( $N = 604$ , aged  $M = 29.4$  years,  $SD = 9.0$  [range 18–63 years]) volunteered to complete the online survey. The inclusion criteria were participants 18 years or older who self-identified as having experience of the MC with menstrual bleeding during their sport/exercise practice. Individuals who had experienced loss of periods associated with HC use were still eligible to participate if they also had MC with bleeding experience while engaging in their sport/exercise practice. Participants were included if they had a menstrual bleed between 14 and 90 days to allow those with irregular cycles to complete the questionnaire as they may also experience menstrual-related symptoms. Exclusion criteria were those who had never experienced a MC and those younger than 18 years.

Participants stated 30 countries of origin: 72.68% ( $n = 439$ ) from the United Kingdom, 15.70% ( $n = 95$ ) from continental Europe, and 11.59% ( $n = 70$ ) from North America, Asia, Oceania, Africa, and South America. Almost two thirds of participants ( $n = 384$ ) identified as nonreligious, 34.27% ( $n = 207$ ) as belonging to a religion, and 2.15% ( $n = 13$ ) as agnostic.

Sampling was gender-inclusive; no measure of gender identity or biological sex was taken. Recruitment occurred via social media (Twitter, Facebook, and Instagram), email, and word of mouth. Sports teams, governing bodies, university clubs, and other gatekeepers (e.g., coaches, psychologists, physiologists) were contacted directly with a survey link and invitation to eligible members regarding participation. Participants were self-selected to take part on a voluntary basis. Using a sample size calculator (Raosoft.com) with a 5% error margin, 95% confidence interval, recommended population size of 20,000, and 50% response distribution, the recommended sample size was 384. With 604 participants, the minimum recommended sample size was exceeded.

### Materials

The survey was compiled using a web-based platform (Question-Pro). As there are no validated MC- and HC-related questionnaires within a sporting context, the survey was compiled based on previous questions within survey-based studies in this area (e.g., Bruinvels et al., 2021; Martin et al., 2018). Feedback from eight pilot participants informed content and formatting. The final version (see Supplementary Materials [available online]) consisted of up to 50 questions (mean completion time = 24.83,  $SD = 18.34$  min). Question topics (covered within the present study) included self-reported demographics, sport/exercise participation, HC use, menarche and amenorrhea, MC symptoms/bleeding, and menstrual product use. Question types included single- and

multiple-choice items, rating scales (Likert), and open-text (qualitative) questions. For example, symptom frequency of occurrence was explored using “Looking at the list of common MC symptoms below, for every symptom you experience, please tick the box to indicate how often you experience it” (every month, most months, sometimes, rarely, never, and I’m unsure if I have experienced this symptom). Symptom severity was explored with the question “Looking at the list of common MC symptoms below, for every symptom you experience, please tick the box to indicate how severe you perceive it to be” (not at all, very mild, mild, average, severe, very severe, and I’m unsure if I’ve experienced this symptom). Symptoms experienced which were outwith those listed could be described in a follow-up question. The perceived impact of symptoms on performance was explored with the following question: “In your own words, please describe the impact menstrual symptoms you experience have on your ability to perform in your sport both at training and competition.” Participants’ responses determined subsequent questions, that is, participants identifying as having never used HCs would not access/answer follow-up questions on HC use.

Additional items related to support and communication practices relating to the MC and HC use in exercisers and athletes will be reported in a subsequent article.

## Procedure

Ethical approval was granted by the Liverpool John Moores University (LJMU) Research Ethics Committee (reference 19/SPS/068). The survey was online for 6 months (July 22, 2020 to January 2, 2021), viewed 8,198 times, with the commencement of 1,429 responses. Responses were considered complete when participants reached the final question of the survey. However, due to the potential perceived sensitivity of this area, participants were free to by-pass questions if they did not wish to answer. Therefore, the data yielded 639 complete responses (completion rate: 44.70%), with data from participants ( $n=32$ ) identifying as <18 ( $n=8$ ) or having never experienced menstrual bleeding ( $n=24$ ), being menopausal ( $n=2$ ), and having had a hysterectomy ( $n=1$ ) excluded; thus, the sample total was 604.

## Data Analysis

We used a convergent parallel mixed-methods approach (Morse & Niehaus, 2009). Quantitative data analysis was performed using Jamovi (Version 1.6.23; The Jamovi Project, 2021). Data were summarized using descriptive statistics (presented as  $M$ ,  $SD$ ). Chi-square tests of association were performed on categorical and ordinal variables pertaining to MC symptoms. The assumptions for the chi-square test of association of two variables being measured at the ordinal or nominal level and each variable containing two or more independent groups were met. When expected counts were <5, the category with the lowest counts were merged with the nearest category, for example, very severe with severe, and the chi-square test for association was retested until the assumption of expected counts was met. Participants were divided into two groups for comparative analyses: (a) current HC users ( $n=225$ ) and (b) those with an MC ( $n=379$ ), using a chi-squared test for association of the variables captured under symptom frequency of occurrence and severity of symptoms. Where participants responded to symptom frequency of occurrence/severity items with more than one value (0.50% and 1.00% of all responses, respectively), the highest value was taken to account for the diminishing

effect of recall bias on pain perception and avoiding further empirical lessening of already underrepresented experiences.

Qualitative responses were analyzed using qualitative content analysis (Mayring, 2004) in NVivo (version 12; Lumivero); descriptive codes were first assigned to the data, grouped to identify subcategories and overarching categories, and subsequently interpreted using a thematic analysis approach (Braun & Clarke, 2012). The emergent qualitative results were discussed and agreed upon by all members of the research team.

## Results

Respondents participated in 85 different sports or physical activities, categorized broadly as individual ( $n=349$ ; 57.78%), team ( $n=203$ ; 33.61%), artistic ( $n=15$ ; 2.48%), or exercise/other ( $n=37$ , 6.13%). One third ( $n=208$ ; 34.43%) had been training in their main sport between 1 and 5 years, and 42.21% ( $n=255$ ) for 5–15 years. Almost 90% had competitive experience; according to recommendations by Swann et al. (2015), participants were categorized as elite (international/commonwealth/European competition:  $n=103$ ; 17.05%), semi-elite (national/regional/university competition:  $n=278$ ; 46.03%), recreational athletes (local competition:  $n=154$ ; 25.49%), or exercisers ( $n=69$ ; 11.42%).

In total, 385 (63.74%) participants accessed a main coach who was responsible for the majority of support at training/competition; 103 (17.00%) had more than one coach, while 94 participants (15.56%) coached themselves. Of those that accessed a coach, 253 (65.71%) participants were coached by men, 95 (24.60%) by women, and 36 (9.30%) by coaches of mixed genders (male and female: 8.55%; nonbinary: 0.78%).

## Use of HCs

Over one third ( $n=225$ ; 37.10%) of participants reported current HC use; 62.90% disclosed historical ( $n=180$ ; 29.80%) or no ( $n=200$ ; 33.11%) prior HC use. There were nine accounts of concurrent HC use: combining oral contraceptives with the implant ( $n=8$ ) or an intrauterine device (IUD;  $n=1$ ). Motivations for HC use are outlined in Table 1 with participants selecting between one and all listed. Twelve “other” responses were provided (e.g., endometriosis, convenience, minimize bleeding).

## Menarche and Amenorrhea

Self-reported age at menarche was  $M=12.73$  years,  $SD=1.48$  (range: 8–18). The majority (90.90%) experienced their first period between 11 and 15 years. Secondary amenorrhea, defined as an absence of menstrual bleeding for three cycles or 90 days or greater (Casas & Chuang, 2020) was experienced by 34.10% ( $n=206$ ), of which 169 (80.10%) participants reported historical experiences and 37 (17.96%) were amenorrheic at the time of the survey. Participants reported the causes (if known) of current/historical amenorrhea. These participants’ verbatim responses related to perceived causes (if known) of current/historical amenorrhea were categorized and counted (see Table S1 in Supplementary Materials [available online]).

## MC or Withdrawal Bleeding Characteristics

On average, MC duration was  $28.8 \pm 4.5$  days. The majority of participants ( $n=562$ ; 93.04%) bled between 2 and 8 days per

**Table 1** Prevalence of and Motivations for Hormonal Contraceptive Use

Hormonal contraceptives (N = 225)	n	Percentage of users
Oral contraceptive	160	71.11
Intrauterine device	38	16.89
Implant	23	10.22
Injection	2	0.89
Patch	2	0.89
Motivation for taking hormonal contraceptive <sup>a</sup>	n	Percentage of responses
Contraception	186	42.96
Symptom management	83	19.17
Regulate menstrual cycle	82	18.94
Delay/stop period for an important event	28	6.47
Manipulate period duration	26	6.00
Dermatological reasons (e.g., acne)	24	5.54
Other	12	2.77

Note. A total of 433 responses were received from 225 participants.

<sup>a</sup>Participants could report up to five reasons.

month. While exact variations were not measured, 51.32% ( $n=310$ ) experienced at least some variation in MC length. Heaviness of bleeding was rated by 2.80% ( $n=17$ ) of participants as “very light,” 6.60% ( $n=40$ ) as “very light to light,” 34.80% ( $n=211$ ) as “light to moderate,” 37.10% ( $n=225$ ) as “moderate to heavy,” 14.07% ( $n=85$ ) as “heavy to very heavy,” and 4.30% ( $n=26$ ) as “very heavy.”

### Use of Menstrual Products

A total of 282 (46.69%) participants stated they used more than one of the menstrual products listed (see Table S2 in [Supplementary Materials](#) [available online]) simultaneously, at least sometimes. The most common menstrual products were disposable pads ( $n=394$ ; 65.23%), followed by tampons ( $n=386$ ; 63.90%). Typical motivations for simultaneous use included “extra protection” against heavy bleeding, avoiding leaks/stains and enabling greater time between changing products.

### Prevalence of Symptoms

Of the 604 participants, 28 (4.64%) did not experience any symptoms. The 28 symptoms included in the survey are listed in order of prevalence in Table 2. To ensure only participants with certain symptomatic experiences were counted, “never” and “unsure” responses were excluded from the prevalence calculations. The five most common symptoms were abdominal cramps (93.05%), mood changes (90.56%), tiredness/fatigue (88.25%), feeling irritable/angry (87.58%), and feeling sad/teary (87.58%). The least common symptoms were hot flushes/sweating (57.45%), nausea (52.32%), lack of coordination (44.04%), migraines (36.09%), and vomiting (18.71%).

### Frequency of Occurrence of Symptoms

Figure 1 shows the frequency of occurrence (every month, most months, sometimes, rarely, never, and unsure) of symptoms reported by MC/HC users. Full symptom frequency data are included (see Table S3 in [Supplementary Materials](#) [available online]).

Chi-square tests of association examined the relationship between MC/HC users and symptom frequency of occurrence. Statistically significant results were obtained for the following symptoms: weight gain:  $\chi^2(4, 449) = 17.50, p = .002$ ; water retention:  $\chi^2(4, 450) = 12.50, p = .014$ ; lack of coordination:  $\chi^2(4, 450) = 11.90, p = .018$ ; hot flushes/sweating:  $\chi^2(4, 532) = 10.30, p = .035$ ; flooding/leaking:  $\chi^2(4, 536) = 12.60, p = .014$ ; and reduced ability to concentrate:  $\chi^2(4, 523) = 11.50, p = .022$ .

### Severity of Symptom Experiences

Figure 2 shows the severity of symptoms (very severe, severe, average, mild, very mild, not at all, and unsure) reported by MC/HC users. Full-severity results are included in Table S4 (in [Supplementary Materials](#) [available online]). Chi-square tests of association between MC/HC users and symptom severity yielded one statistically significant result with flooding/leaking:  $\chi^2(5, 481) = 11.70, p = .039$ .

Abdominal cramps were the most frequently noted severe and very severe symptom for all participants, MC and HC users (36.92%, 39.32%, and 32.89%, respectively). Further symptoms with the highest ratings of severity included mood changes (26.16%, 25.07%, and 28.00%), tiredness (25.33%, 25.59%, and 4.89%), feeling sad/teary (26.16%, 24.27%, and 29.33%), feeling irritable/angry (22.85%, 22.43%, and 23.55%), changes to bowel habits (21.02%, 20.84%, and 23.33%), and bloating (21.02%, 20.84%, and 21.33%). The least prevalent severe and very severe symptoms include vomiting (1.49%, 1.32%, and 1.78%), lack of coordination (3.64%, 4.49%, and 5.33%), and nausea (4.80%, 4.49%, and 5.33%).

### Additional Symptoms

A subset ( $n=107$ ) of participants volunteered additional experienced symptoms outside those listed. Physical symptoms included: (non-abdominal) muscle pain/cramp and/or joint pain ( $n=24$ ), acne/skin concerns ( $n=18$ ), feeling weaker/slower ( $n=9$ ), vertigo/dizziness/light-headedness/fainting ( $n=10$ ), “heaviness” in legs ( $n=3$ ), gray-out/blurred vision ( $n=2$ ), itching sensation in breasts ( $n=1$ ) and vagina ( $n=1$ ), pelvic (anal, rectal, vaginal, and vulval) pain/

**Table 2 Prevalence of MC or HC Symptoms for MC and HC User Groups**

Symptom <sup>a</sup>	Symptom prevalence (%)		
	All participants (N = 604)	HC users (n = 225)	MC (n = 379)
Abdominal cramps	93.05	91.56	93.93
Mood changes	90.56	91.11	90.24
Tiredness/fatigue	88.25	86.22	89.45
Feeling irritable/angry	87.58	88.89	86.81
Feeling sad/teary	87.58	88.00	87.34
Bloating	87.25	87.11	87.34
Breast tenderness	82.78	80.89	83.91
Upset stomach/changes to bowel habits	79.47	77.33	80.74
Feeling worried/anxious	79.30	79.56	79.16
Lack of motivation	77.15	78.67	76.25
Flooding/leaking	71.03	65.78	74.14
Appetite disturbances	71.20	65.33	73.09
Reduced ability to concentrate	69.70	68.44	70.45
Backache	69.70	65.33	72.30
Lack of focus	69.04	66.67	70.45
Sleep disturbances	68.21	67.11	68.87
Increased sex drive	66.56	72.44	63.06
Feeling distracted	66.23	65.78	66.49
Headache	64.90	69.33	62.27
Reduced sex drive	61.75	62.22	61.48
Weight gain	60.76	61.33	60.42
Water retention	60.10	58.22	61.21
Blood clots	59.77	56.89	61.48
Hot flushes/sweating	57.45	53.33	59.89
Nausea	52.32	52.00	52.51
Lack of coordination	44.04	43.56	44.33
Migraines	36.09	36.44	35.88
Vomiting	18.71	19.56	18.21

Note. HC = hormonal contraceptive; MC = menstrual cycle.

<sup>a</sup>Reported experiencing a symptom “every month,” “most months,” “sometimes,” or “rarely.”

vaginismus and related symptoms (*n* = 8), flatulence (*n* = 2), increased pain sensitivity (*n* = 2), ovarian cysts (*n* = 2), increased energy (*n* = 2), quicker to fatigue/slower to recover (*n* = 2), limitations to flexibility (*n* = 1), fibroids (*n* = 1), irritable bowel syndrome flare-ups (*n* = 1), ovulation pain (*n* = 1), juvenile idiopathic arthritis (*n* = 1), heightened sense of smell (*n* = 1), weight loss (*n* = 1), and retching (*n* = 1). Psychological/affective symptoms included: food cravings (*n* = 4), depression (*n* = 4), reduced self-esteem/confidence (*n* = 3), emotional lability, such as tearfulness (*n* = 2) and panic (*n* = 1), word-finding difficulty (*n* = 1), disordered eating behaviors (*n* = 1), nightmares (*n* = 1), and increased sensory experiences resulting in sensory overload and social anxiety (*n* = 1).

**Symptom Management Strategies**

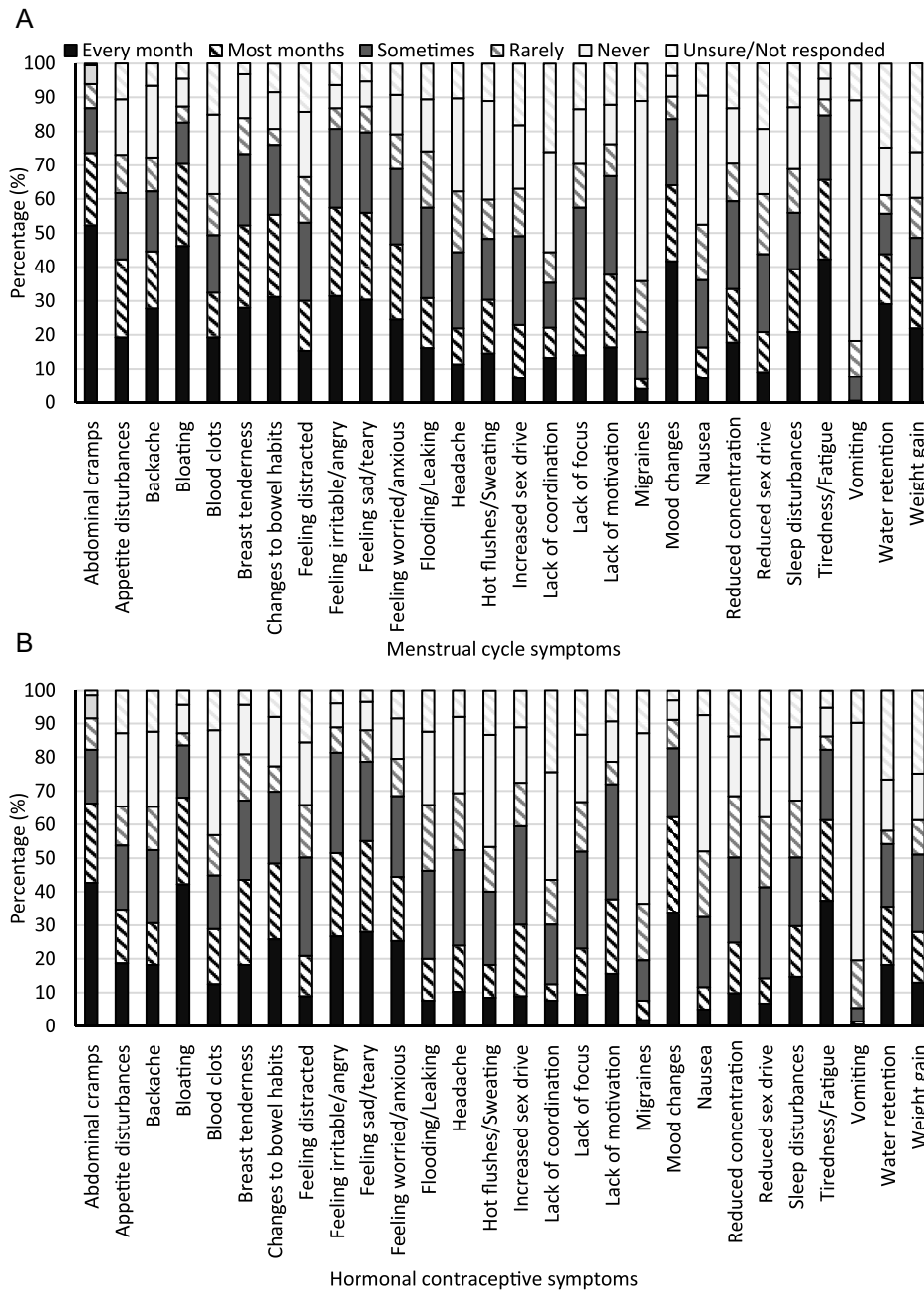
Over half (*n* = 325; 53.80%) of participants used medical strategies, and 72.10% (*n* = 436) used other strategies, at least sometimes. Results were consistent across MC/HC users; 55.40% and 75.60% of HC users reported medical/other strategy use, respectively, compared to 57.58% and 76.58% of MC. Results pertaining to medical and other strategy use are available in the Supplementary Material (Supplementary Table 5 [available online]). Qualitative

responses (*n* = 576) related to medical and other (e.g., behavioral and cognitive/psychological) strategies used to alleviate MC symptoms were categorized (by drug classification group for medical strategies, by primary function for other).

**Symptoms: Qualitative Analysis**

A qualitative description of the impact of their MC symptoms on their sport/exercise performance at training/competition was provided by 452 participants. Descriptive codes and sub/overarching themes derived from participants’ responses (with illustrative quotes) are in Table 3.

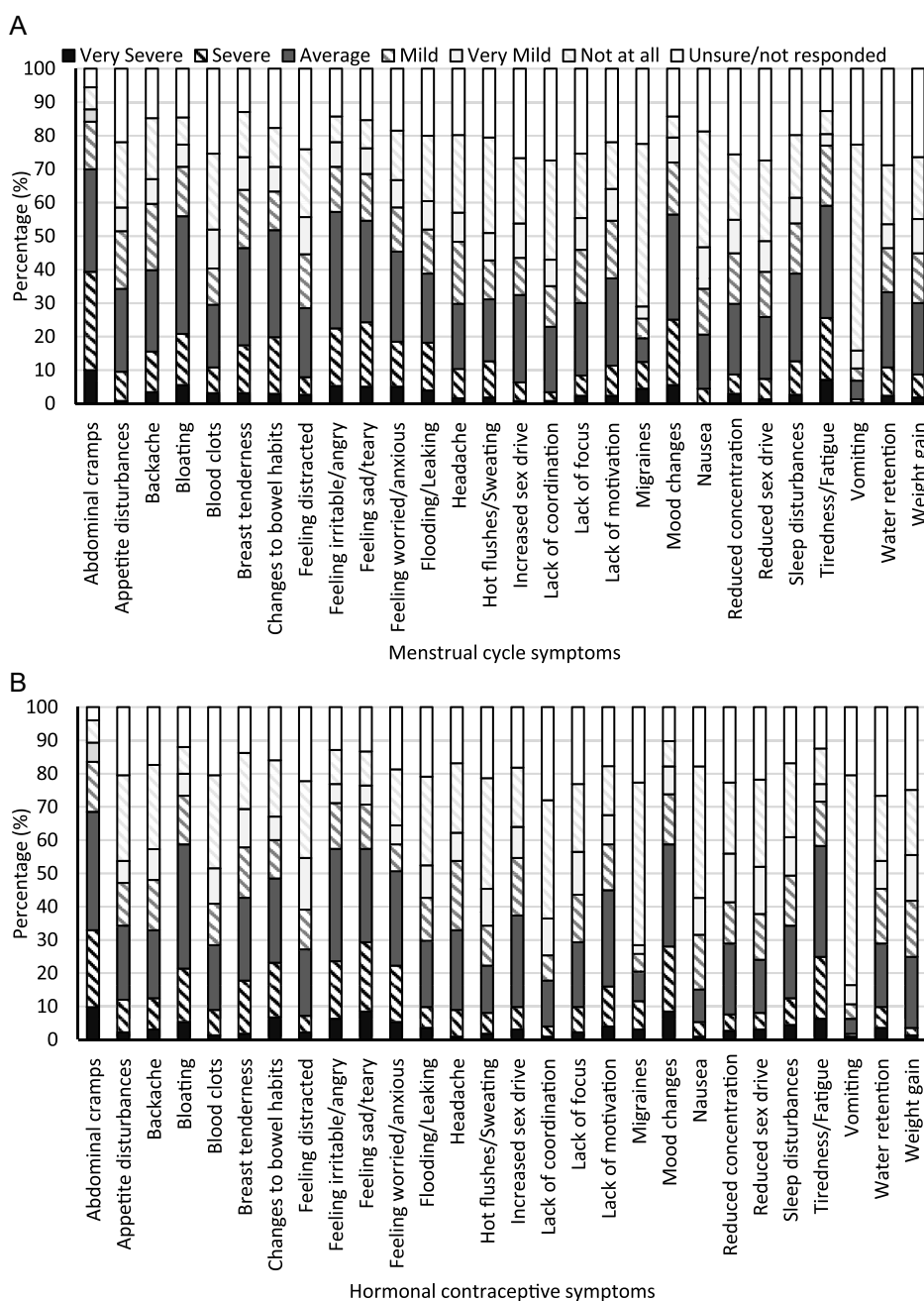
The first theme describes the physiological, psychological/cognitive, and emotional/affective impacts of participants’ MC symptoms. The detrimental effect of dysmenorrhea was particularly apparent and mentioned 61 times. A “Brazilian Jiu-Jitsu” (B-JJ) athlete described it as; “It feels like my soul is exiting through my cervix.” Many felt able to attend training/competition despite painful menses, though some were left bedridden. Pain was not the only disadvantageous physiological sensation, and simultaneous symptom experiences were common: “Tire quicker, muscles ache for longer effecting [*sic*] performance, tore ACL [Anterior Cruciate



**Figure 1** — Frequency of menstrual cycle symptoms experienced by participants with (A) a menstrual cycle and (B) hormonal contraceptive users.

Ligament] whilst on my period, feel weaker”—footballer. Increased self-consciousness, reduced self-confidence, and self-criticism are attributed to negative performances. “In competition it can reduce my confidence and focus when I feel uncomfortable and am aware of my body”—hockey player. Reduced focus was exacerbated when participants perceived their environment as hindering menstrual management: “. . . I become mentally distracted, constantly analyzing how ‘comfortable’ my sanitary products feel and whether I need to grab a painkiller or change a tampon”—rugby player. The “emotional rollercoaster” associated with affective symptoms was of particular concern, causing a self-identified decline in mental health status for six individuals. Frustration at perceived reductions in ability and apathy toward performance standards/competition results were common.

The second theme relates to participants’ experiences and negotiations of menstrual stigma and taboos. Menstrual and bleeding concealment was a great source of anxiety. There were 77 references to flooding: “Always scared of leaking whilst training, worried about potential smell, confidence decreases”—B-JJ athlete, and/or concealing menstrual products, “. . . I have to worry about hiding my tampon string!”—swimmer. White, light, and tight uniforms made concealment difficult, increasing flooding anxiety and body dissatisfaction. The perception of menstrual concealment as necessary disrupted performance: “I don’t think I’m learning anything when my focus in the training session is surviving, and not letting anyone know I’m on my period”—Thai boxer. A sailor argued male-dominated sporting environments resist open menstrual and bleeding communication: “The sport



**Figure 2** — Severity of menstrual cycle symptoms experienced by participants with (A) a menstrual cycle and (B) hormonal contraceptive users.

is geared towards men, and even as a coach I found it incredibly difficult to support my female athletes without some push back.” She recalled an inability to access toilets and change menstrual products while training on water and being forced to wash blood from herself and her boat. Similar experiences were shared by other athletes, often but not always in outdoor sports. Athletes described a perceived lack of empathy from male coaches: “. . . having a male coach I feel that I cannot express that and my pain won’t be taken as seriously”—basketball player and peers, “you can’t ask the boys to go light because your tummy is cramping”—Thai boxer.

The third theme comprised perceived positive aspects of menstruation participants identified as individually beneficial, protecting them from otherwise potentially challenging experiences. Negative performance was not universal; 48 participants

felt their menses/symptoms had little or no impact on their ability to train/compete. Menstruation was sometimes considered as performance-enhancing; two runners achieved personal bests while menstruating. Athletes from “aggressive” sports stated performance advantages; a rugby player learned to “channel my hormones and become more aggressive on the pitch,” though they noted menstruation-linked anger was unhelpful during noncontact training. A boxer stated “being angry helps,” and one runner observed her period had a “good impact” on her performance, providing an outlet for “all the anger and negative emotions . . . No one gets hurt!” Unlike masculine sporting environments, female teams were considered sympathetic to menstrual and HC use difficulty; “All the girls are so supportive and lovely”—cheerleader. However, consistent, high-quality menstrual support

**Table 3 Overarching Themes, Subthemes, and Descriptive Codes of Symptom Impact Qualitative Responses**

Overarching theme (name and description)	Subthemes	Descriptive codes	Participant quotes
<i>Impact of symptoms:</i> Self-reported physiological, psychological/cognitive, and emotional/affective impact of menstrual cycle symptoms on sport/exercise performance ability.	Physiological	Pain, pain-affected performance, weakness, breathlessness, reduced energy availability, slowed down, reduced abilities or performance, reduced skill development, increased injury risk, physical discomfort, negative physical change, and not making weight.	“The biggest impact is managing the abdominal pain on day one of my period.” “Physically slower, more sluggish. Reduced pain tolerance as already painful.”
	Psychological/cognitive	Hypervigilance, hygiene anxiety, body dissatisfaction, performance anxiety, low self-confidence, self-criticism, hard to concentrate, lack of motivation, denial, and inability to plan.	“... I was very self conscious that I would bleed through clothing or start my period unexpectedly at training or competitions because of the lumpy clothing athletes wear like crop top & tiny pants. I would feel bloated & fat when racing & perform poorly.”
	Emotional/affective	Emotional instability, general anxiety, frustration, and apathy.	“The emotional rollercoaster is the toughest part.”
	Menses concealment	Flooding fear, fear of hygiene product visibility, sport uniform, and fear of weight gain.	“Always scared of leaking whilst training, worried about potential smell, confidence decreases.”
	Communication (or lack of)	Judgment by others (perceived and experienced), male insensitivity, pressure to subvert sexist assumptions, and unaware of symptom impact.	“I already had to work twice as hard to be accepted in a male dominated area, you can’t undo that by mentioning periods because so many men are weirded out by them. You just have to grit your teeth and cope.”
<i>Menstrual stigma and taboos:</i> Experiences/anxieties related to menstrual taboo and factors that contribute to a culture of stigma in sport and exercise.	External influences	Inadequate changing/toilet facilities and hygiene product problems.	“Saddle sores are bad enough without the extra worry of where your next toilet stop will be and how you will carry spare tampons, and what if you leak whilst out on a ride miles away from anywhere ...”
	Direct positive impact on performance	Performance enhancement, feeling better through exercise, and increased strength.	“Sometimes the mood changes also help to increase my performance. Being angry helps sometimes to push harder in training/competition.”
	Indirect positive impact on performance	Symptoms are not impactful.	“No big impact, I am still able to train and just reduce intensity slightly. As I am not taking part in big competitions, I am very easily able to continue as normal 99% of the time.”
	Social support	Support from others and less pressure in recreational sport.	“Because it’s all girls that do cheer on our team it’s honestly very supportive and understanding.”
	Impact on health	(Positive) weight gain and finding contraception helpful.	“If my period comes the week or week before a competition, I consider that with the weight class I sign up for. Period is good for 5–7 lbs weight gain.”
<i>Protective factors:</i> Effects of the menstrual cycle self-identified as beneficial or positive to the individual.	Solution-focused	Reducing intensity, tracking menstrual cycle, mapping training onto cycle, helpful hygiene products, and sport/exercise as active distraction.	“Since I discovered the menstrual training, it helps me to [build] confidence to push further during my first week of period. Really increases my physical performance.”
	Psychological	Mind over matter, pushing through pain, sharing and bonding, channeling anger, and increasing menstrual awareness	“Feeling bloated, heavy, tired, nauseous on a competition day is not ideal but I’ve always managed to push through and perform regardless.”
	Avoidant	Menstrual suppression (and its benefits), holding back from maximum effort, and abstaining from sport/exercise.	“I would not compete when near or on my period as I’m too emotionally unstable. I take off a few days of training for the same reasons.”
<i>Coping strategies:</i> Solution-focused, psychological, and avoidant strategies to cope with the impact of menstrual cycle symptoms. Strategy usage may contribute to positive results and/or unintended adverse consequences.	Solution-focused	Reducing intensity, tracking menstrual cycle, mapping training onto cycle, helpful hygiene products, and sport/exercise as active distraction.	“Since I discovered the menstrual training, it helps me to [build] confidence to push further during my first week of period. Really increases my physical performance.”
	Psychological	Mind over matter, pushing through pain, sharing and bonding, channeling anger, and increasing menstrual awareness	“Feeling bloated, heavy, tired, nauseous on a competition day is not ideal but I’ve always managed to push through and perform regardless.”
	Avoidant	Menstrual suppression (and its benefits), holding back from maximum effort, and abstaining from sport/exercise.	“I would not compete when near or on my period as I’m too emotionally unstable. I take off a few days of training for the same reasons.”



was rare, even for international athletes. “Under my current coach and medical staff I feel comfortable to tell them why I feel so awful and they are understanding but that is incredibly rare and not something I’ve found with any other staff team”—rugby player. Some found sport/exercise participation directly reduced or distracted from pain; “Before I train/compete I am worried it will affect my performance but once I start playing I often forget about it”—netball player.

The final theme referred to participants’ solution-focused, psychological, and avoidant coping strategies aimed at reducing the impact of MC and HC use symptoms. Reducing training intensity during menses/bleeding was referred to 45 times, though there were 75 accounts of menstrual/bleeding distress sufficiently great as to require abstaining from training/competition. Tracking cycles and adjusting training demands were solution-focused strategies identified as positively affecting performance. A snowboarder stated, “Since I know how my body works better, I still feel less motivated but my training and performances are far better during my periods, as I trust myself more.” Psychological coping included accepting pain/menstrual difficulty as inevitable so as to “just get on with it.” A kickboxer explained, “Mentally: I don’t let it have an impact. As a child I was raised to not see it as an obstacle.” A national-level swimmer affirmed, “I honestly just kind of suck it up and have been for years. It wasn’t an excuse to not train,” though she noted, “It makes it more difficult for sure, but training the way that I did, we couldn’t just stop.” However, some “pushing through” produced adverse responses: “I’ve had a couple of competitions on my period and they have been my toughest and most exhausting competitions. I still fought because I wanted to win for me and my team, but it was exhausting and I was in a lot of pain”—B-JJ athlete. Many found MC/HC symptoms/dysmenorrhea sufficiently disruptive so as to render respite essential. Self-reported breaks from training lasted from hours to several days/weeks. Some elected to suppress or delay bleeding to avoid feeling bound by their bleeding: “Competition-wise I always ensure my contraception is aligned to not be on my period, e.g., doubling up on the pill”—triathlete. A footballer perceived a culture of coveted menstrual suppression among coaches/selectors: “. . . selectors now make note of your menstrual cycle and players who don’t have the periods during the tournament are kept in mind.” However, while for some participants HC protected against the negative impact of menstruation, its effect on others was detrimental. For one B-JJ athlete, “it [the pill] messed with my cycle and my hormones too much” while a Paralympic alpine skier described more serious consequences: “IUD has resulted in depressive episodes twice now which severely impacts performance.” As one runner explained, for the most severely affected, menstrual performances (regardless of HC coping strategies) may remain challenging: “At their worst they completely stopped me from training or competing. Now, after getting surgery and an IUD (Mirena) they ‘only’ make it more difficult.”

## Discussion

The aim of this study was to determine the symptom severity and frequency in MC and HC users, exploring the perceived impact of MC and HC user symptoms on exercise and sport performance. Most (95.40%) participants experienced symptoms, with some symptoms more frequent (weight gain, water retention, lack of coordination, hot flushes, flooding, reduced concentration) and severe (flooding) in MC compared to HC users. In qualitative responses, participants highlighted experiences related to menstrual stigma and taboo, the psychological impacts of symptoms,

coping strategies used, and positive feelings toward menstruation. These data evidence the multifaceted impacts of MC/HC use and related symptoms on performance and demonstrate the significant prevalence of severely and very severely experienced symptoms across a diverse, global athletic population. The most frequent symptoms within the total sample were abdominal cramps, mood changes, tiredness/fatigue, feeling irritable/angry, feeling sad/teary and bloating. Physiological, psychological, and affective symptoms were all among the most prevalent, highlighting the many-sided effects of menstruation on the individual (Armour et al., 2020; Brown et al., 2021; Bruinvels et al., 2021; Caballero-Guzmán & Lafaurie-Villamil, 2020; Findlay et al., 2020). Abdominal cramps were experienced every month by over half of all participants, and more than two-thirds experienced mood changes every or most months, remaining the first and second most prevalent symptoms irrespective of HC status.

In contrast to previous research in large samples of exercising women (e.g., Bruinvels et al., 2021; Martin et al., 2018), we assessed the severity of symptoms experienced by MC and HC users. Seven of the 28 symptoms were reported as severe or very severe by at least 20% of participants. Consequently, these symptoms could have a significant impact on well-being, training, and performance and should therefore be a principal focus for athletes, practitioners, and researchers. Abdominal cramps were the most severely experienced symptom (in addition to the most prevalent and frequent); 36.9% of all participants rated their experience as either severe or very severe, almost double (18.9%) those perceiving them as mild or very mild. Mood changes, fatigue, and feeling sad/teary were rated as severe/very severe by more than one in four participants, while over one in five reported severe/very severe irritability/anger, changes to bowel habits, and bloating. In addition, severe/very severe anxiety during menses was reported by 19.87% of participants. Such findings are of particular significance for coaches and multidisciplinary practitioners supporting athletes. Athletes feeling obligated to train through pain were perceived as detrimental to the individual, a finding mirrored in previous research (Findlay et al., 2020). While “pushing through” injury-related pain is seemingly admired in the sporting world (Malcom, 2006; Sabo et al., 1998; Theberge, 2003; Young, 2004), participants described reluctance to label their pain’s source as menstrual, fearing rejection and/or a lack of empathy, particularly from men. Such results highlight that perceived severe/very severe symptomatic experiences are common, a consideration for coaches and practitioners examining how current training and support systems help or hinder menstruating and bleeding athletes in pain. Furthermore, the lack of research on medical management of menstruation is compounded by the comparative underrepresentation of female athletes in sport and exercise research (Costello et al., 2014). It is vital that academics and researchers conduct further investigation into MC/HC users’ symptom management in the hope that it may result in female athletes and exercisers performing without perceived detriment on any given day in their cycle. However, it is important to note that not all participants perceived the MC or HC use as being detrimental, and a small proportion of athletes (particularly in “aggressive” sports) noted perceived menstruation-linked performance benefits. It is therefore paramount to consider individual differences in perceived ability during menses when facilitating menstruation-supportive training.

Participants using HCs reported several symptoms (e.g., water retention, flooding, reduced concentration) as less frequent and flooding as less severe compared to MC women. While this finding differs from that of McNulty et al. (2024), the reported disparity in

symptomology between women with natural MC and HC users is consistent with previous research (Carey & Allen, 2012; Martin et al., 2018). Elite athletes have also been shown to have a high prevalence of HC use, partially due to the perceived noncontraceptive benefits, including symptom management (Martin et al., 2018). Previous research of athletes (Armour et al., 2020; Brown et al., 2021; Caballero-Guzmán & Lafaurie-Villamil, 2020; Findlay et al., 2020), including HC users (Martin et al., 2018; Parker et al., 2021), reported self-management of menstrual discomfort. Participants in the present study used medical and other strategies to negotiate the perceived impact of MC symptoms on performance. Over half of participants used pharmaceuticals, and three-quarters also used behavioral/psychological strategies, including heat, rest, and comfort food. Around a third found sport/exercise engagement reduced pain/symptoms, a benefit also observed within general, nonathletic populations (Johnston-Robledo & Chrisler, 2013; Lavanya, 2011). In contrast, 16.50% of athletes surveyed stated their menstrual discomfort was so great as to require a significant reduction or total avoidance of sport/exercise, a greater proportion than previously found among elite athletes (Martin et al., 2018; Parker et al., 2021), who may feel more pressure to attend training.

Qualitative studies (Armour et al., 2020; Brown et al., 2021; Caballero-Guzmán & Lafaurie-Villamil, 2020; Findlay et al., 2020) of small populations have explored athletic menstrual narratives in depth, though this may be limited by the small cohort subject to investigation. The present study is unique in its analysis of qualitative questionnaire data from a large-scale population, giving voice to a greater number of participants from more diverse sports and competitive backgrounds. Qualitative results confirmed that self-reported increased (during menses) hypervigilance, performance anxiety, self-consciousness, frustration, and lack of motivation were perceived as detrimental to performance (Brown et al., 2021; Findlay et al., 2020; Stewart et al., 2010). Anxieties related to menstrual concealment (flooding fear, access to bathrooms, inability to change menstrual products) were common and not sport-specific. Consequently, increased compensatory behaviors, such as self-checking, frequent bathroom visits, and simultaneous menstrual product use, were noted. This supports previous research covering a range of sports—including weightlifting, climbing, and athletics (Brown et al., 2021), rugby (Findlay et al., 2020), swimming (Caballero-Guzmán & Lafaurie-Villamil, 2020), trampoline (Stewart et al., 2010), mixed ball sports, dance, and gymnastics (Moreno-Black Vallianatos, 2005). Previous qualitative findings (Armour et al., 2020; Brown et al., 2021; Caballero-Guzmán & Lafaurie-Villamil, 2020; Findlay et al., 2020) are echoed on a larger scale in the present study, namely that anxiety and behaviors related to menstrual concealment increase in the presence of men, while communication related to menstrual status and related needs decrease. Recent research that included both female athletes and coaching staff's perspectives on supporting menstruation has noted a mutual avoidance of female hormone-related discussions (Hook et al., 2021), with male coaches less likely to discuss MC with athletes than female coaches (Kroshus et al., 2014). This is assumed to occur due to perceived lack of knowledge; female athletes may have limited knowledge as to how MC may impact performance and wellbeing; HC users may assume that MC-related discussion is not relevant for them; and athletes may perceive MC and HC-related discussion as being beyond their coaches' knowledge and expertise (Höök et al., 2021). Furthermore, female athletes report a feeling of "unease" in MC discussions with male coaches (Findlay et al., 2020; Solli et al., 2020), suggesting further education is likely required to facilitate more

comfortable interactions. Many participants in the present study stated reluctance to discuss menstruation with men (typically coaches/teammates). For those in male-dominated sports and/or environments, admitting pain or menses-linked performance detriment was perceived as risking ridicule or other negative consequences. This finding is highly pertinent for male practitioners supporting menstruating athletes, as it suggests neglecting to consider gender norms/differences is to the detriment of both affected athletes and a perceived supportive menstrual culture.

## Strengths, Limitations, and Recommendations

The primary strength of this research is that it is the first study to quantitatively assess symptom severity in a sample of athletes and exercisers. It also includes participants from a wide range of sports, countries, and competitive abilities, while also using mixed-methods data analysis to ensure individual experience was not lost in favor of ordinal ratings of symptom experience. It provides a new understanding regarding the reported prevalence of severely experienced symptoms within athletic populations, with clear applied practice implications for coaches and multidisciplinary practitioners. The range of participants' sport/physical activity types is greater than those captured within previous small- and large-scale studies, evidencing the generalizability of previously discovered themes into a wider range of sporting contexts. The similarities and differences in narratives highlight how menstruation is truly an individualized experience.

The authors acknowledge that, like other surveys of this nature (Armour et al., 2020; Bruinvels et al., 2021), participants may have completed the survey at different points within their MC. This study also did not capture the time in the cycle when participants' symptoms were experienced. However, it is recognized that pain intensity recall is reduced after a painful experience ends due to the limitations of autobiographical memory processes (Müller et al., 2019; Robinson & Clore, 2002). Future research, particularly related to MC symptom severity, may benefit from capturing experiences in the moment. While participants could voluntarily report having a known underlying MC dysfunction (e.g., endometriosis:  $n = 14$ , polycystic ovary syndrome:  $n = 10$ ), no specific item related to such conditions was included within the survey, which may have impacted reported symptom severity if not disclosed. In addition, although online recruitment aided in reaching a more global audience, potential participants not using social media may have been missed. Furthermore, the length and required detail of the survey may have impacted its completion; participants contributing missing/incomplete answers may have experienced survey response fatigue (Egleston et al., 2011; Porter et al., 2004). Participants were also not asked to specifically name the HC types used at the time of taking the survey, and no distinction was made between hormonal/nonhormonal IUDs or combined compared with progestin-only oral contraceptives. Therefore, it is unknown whether participants identified as current HC users were using combined or progestin-only forms, and it is possible that individuals using "copper coils" (nonhormonal IUD) may have been included within the group labeled as currently using HCs. The questionnaire was created specifically to meet the aims of this mixed-methods study, and as a result, the complement of questions has not been validated. Finally, the survey was conducted during the first wave of the COVID-19 pandemic; current research evidence (Alvergne et al., 2021; Bruinvels et al., 2021; Demir et al., 2021; Li et al., 2021; Ozimek et al., 2021) suggesting COVID-19 and related lockdowns impact on MC length, bleeding, and symptoms was not yet known at that time.

## Implications for Practice

Coaches, researchers, and practitioners in sport/exercise working with menstruators require increased knowledge and understanding of MC dysfunction and symptoms. Increased awareness of the potential negative (and positive) impacts of menses and MC symptoms on performance is required. Therefore, prescient athletes access greater menstrual education on effective medical and holistic management, potentially reducing a reliance on less effective self-management strategies. Coaches should be aware of the potential impact on athletes' performance and well-being as a result of frequent and/or severe symptomatic experiences during menses. Furthermore, it is recommended coaches develop training programs that identify and support athletes' unique needs during menses, creating a culture sympathetic to menstruation. Future research may wish to consider any positive effects of menstruation on performance to further explore how perceived detriments may be mitigated.

To better support menstruating athletes' sport/exercise performance and well-being, the scientific community needs to research and develop more effective means of managing symptom severity. As findings from the present study demonstrate, severe symptomatic experiences are not uncommon and may be highly impactful. Greater research understanding of MC symptom severity may inform applied support, helping menstruating athletes feel more able to perform throughout their entire MC. Our results highlight the need for encouraging athlete-led, nonjudgmental menstrual communication and the meaningful impact of continuing the establishment of menstruation-supportive training at all levels of sport participation.

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