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The Influence of Menstrual Symptoms on Rehabilitation Adherence and Functional Recovery Among Female Athletes

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ABSTRACT :

Background. Only 55% of athletes return to competitive sport after anterior cruciate ligament (ACL) reconstruction, and adherence to rehabilitation is one of the few modifiable factors behind that outcome. Menstrual symptoms are reported by most exercising women, yet they are almost never recorded as a barrier to rehabilitation.

Aim. To examine how menstrual symptoms such as pain, fatigue, heavy bleeding and mood change may affect adherence to sport-injury rehabilitation and functional recovery in female athletes, and to propose a symptom-informed rehabilitation model.

Methods. A narrative evidence synthesis of prevalence surveys, systematic reviews and meta-analyses on menstrual symptoms in athletes, pain sensitivity in dysmenorrhoea, rehabilitation adherence and return-to-sport outcomes.

Results. Dysmenorrhoea affects about 71% of young women. In surveys of athletes, 77% of elite athletes not using hormonal contraception, 93% of international rugby players and over 80% of 6,812 recreational exercisers reported negative menstrual symptoms. Heavy menstrual bleeding affects 36–37% of marathon runners and elite athletes. Symptoms reduce availability to train. Women with dysmenorrhoea also show heightened pain reactivity, while self-efficacy and perceived treatment efficacy predict adherence. Together these findings define four plausible pathways from symptoms to poorer recovery: missed sessions, reduced effort, impaired psychological readiness and distorted outcome testing.

Conclusion. Menstrual symptoms are a common and largely invisible threat to rehabilitation adherence. Routine symptom screening, iron assessment, symptom-responsive session planning and open communication are low-cost measures that could protect adherence and improve the accuracy of return-to-sport decisions. Direct prospective data in injured athletes are now needed.

Keywords: menstrual symptoms; dysmenorrhoea; heavy menstrual bleeding; rehabilitation adherence; return to sport; female athlete; ACL reconstruction; sports physiotherapy

1. Introduction

Rehabilitation only works if athletes complete it. After ACL reconstruction, for example, 81% of athletes return to some form of sport, but only 65% return to their pre-injury level and only 55% to competitive sport (Ardern et al., 2014). Physical recovery explains part of that gap; the rest depends on what happens between sessions: attendance, home exercise, effort and psychological readiness.

Female athletes bring a factor to rehabilitation that male athletes do not: a monthly cycle of symptoms that can include pain, fatigue, heavy bleeding, gastrointestinal upset, poor sleep and mood change. These symptoms are not rare. Across large surveys, most exercising women report them, and many say they compromise training (Bruinvels et al., 2021; Martin et al., 2018).

Despite this, menstrual symptoms are absent from standard injury-rehabilitation assessments, adherence scales and return-to-sport criteria. A missed session is usually logged as "non-adherence", without asking why. An athlete who underperforms on a hop test during painful menstruation may be judged as not yet recovered.

This article addresses a practical problem: **how do menstrual symptoms affect whether female athletes adhere to rehabilitation, and what can clinicians do to prevent symptoms from undermining functional recovery?** It brings together evidence from women's health, sports medicine and sport psychology, and translates it into a clinical model.

2. Methods

This is a narrative evidence synthesis. PubMed, PubMed Central, Google Scholar and publisher databases were searched for literature published up to October 2026.

Search terms. Combinations of *menstrual symptoms*, *dysmenorrhoea*, *heavy menstrual bleeding*, *premenstrual symptoms* and *hormonal contraception* with *athlete*, *rehabilitation*, *adherence*, *compliance*, *return to sport*, *pain sensitivity* and *functional recovery*.

Evidence sources. Priority was given to (1) systematic reviews and meta-analyses, (2) large prevalence surveys of exercising and elite women, (3) studies of pain processing in dysmenorrhoea, and (4) systematic reviews of psychological predictors of rehabilitation adherence.

Approach. Because almost no study has measured menstrual symptoms and rehabilitation adherence in the same injured cohort, findings were synthesised into mechanistic pathways. Each pathway links a documented symptom effect to a documented determinant of adherence or recovery. Claims about the combined effect are presented as hypotheses for testing, not as established results.

3. The Scale of Menstrual Symptoms in Female Athletes

Menstrual symptoms are the norm, not the exception, among exercising women. The figures in Table 1 come from studies with samples ranging from 15 elite players to more than 21,000 young women.

Table 1. Prevalence and impact of menstrual symptoms in exercising women and young women

Study	Population	Key prevalence findings	Reported impact
Armour et al. (2019)	Meta-analysis; 38 studies, 21,573 young women	Dysmenorrhoea in 71%	20% absent from class; 41% reported reduced concentration or performance
Bruinvels et al. (2021)	Survey; 6,812 exercising women not using combined hormonal contraception	Mood change/anxiety 90.6%, fatigue 86.2%, cramps 84.2%, breast pain 83.1%	Higher symptom frequency associated with missed training and reduced work capacity
Martin et al. (2018)	Survey; 430 elite athletes	77.4% of non-users of hormonal contraception reported negative symptoms, mostly on days 1–2 of menses	39.1% of progestin-only users and 17.8% of combined hormonal contraceptive users reported side effects
Findlay et al. (2020)	Interviews; 15 international rugby players	93% reported negative symptoms; 80% cramps; 33% perceived heavy bleeding	67% felt symptoms impaired performance; 3 of 15 had no one they felt comfortable talking to
Bruinvels et al. (2016)	Surveys; 789 online respondents and 1,073 marathon runners	Heavy menstrual bleeding in 36% of marathon runners and 37% of elite athletes	32% history of anaemia; only 22% had sought medical advice

Note. Figures are as reported by each study. Survey samples are self-selected and may over-represent women who experience symptoms.

Three features of these data matter for rehabilitation. First, symptoms cluster in the first days of menstruation, so their effect is predictable for each athlete. Second, heavy bleeding is common and under-treated, with fewer than a quarter of affected women seeking advice. Third, athletes often do not raise symptoms with staff, which means rehabilitation clinicians are unlikely to hear about them unless they ask.

4. Pathways from Menstrual Symptoms to Rehabilitation Outcomes

Adherence in sport-injury rehabilitation has three parts: attending clinic sessions, completing home exercise, and putting full effort into prescribed work. Recovery also depends on accurate testing to guide progression. Menstrual symptoms can plausibly affect all four.

4.1 Attendance and availability

The most direct effect is missed sessions. Bruinvels et al. (2021) found that the number and frequency of symptoms were associated with missing training and competition. In the general population, one in five young women miss education because of period pain (Armour et al., 2019). Rehabilitation sessions

are often scheduled at fixed times, so a recurring two-day symptom window can remove the same sessions month after month.

In a typical 9- to 12-month ACL programme, a monthly loss of one to two sessions accumulates into a meaningful deficit. The athlete is then labelled non-adherent, even though the cause is predictable and manageable.

4.2 Pain sensitivity and effort

Dysmenorrhoea is not only local pelvic pain. A systematic review of 19 studies found that women with primary dysmenorrhoea show elevated pain reactivity compared with women without it, most consistently during menstruation and in some studies across other phases (Payne et al., 2017). The authors suggest that recurring menstrual pain may help activate central pain pathways.

For rehabilitation, this matters because many exercises are loaded to tolerance: eccentric strengthening, patellar tendon loading, end-range mobility and graft-site work. If pain sensitivity rises during menstruation, the same exercise may feel harder and more painful. Athletes may reduce intensity, stop sets early or skip home exercises, which is under-dosing rather than non-attendance.

4.3 Fatigue, heavy bleeding and iron status

Fatigue was reported by 86.2% of exercising women (Bruinvels et al., 2021). Heavy menstrual bleeding adds a physiological cause: in Bruinvels et al. (2016), 32% of respondents had a history of anaemia. Iron deficiency, with or without anaemia, reduces work capacity and increases perceived exertion.

During rehabilitation, training volume is often reduced and energy intake may fall, which can worsen iron status. An athlete who feels persistently tired may be seen as poorly motivated rather than iron deficient.

4.4 Mood, self-efficacy and psychological readiness

Mood change or anxiety was the most common symptom in Bruinvels et al. (2021), at 90.6%. Psychological factors are also among the best-studied predictors of rehabilitation adherence. In a systematic review of 17 studies, self-efficacy, self-motivation, coping style, goal setting and belief in treatment efficacy were associated with adherence (Goddard et al., 2020).

Symptom days can erode these factors. A poor session during menstruation, such as a painful squat or a weak hop, may be interpreted as a setback, lowering self-efficacy and belief that the programme is working. Without explanation from the clinician, the athlete may draw the wrong conclusion about her recovery.

4.5 Communication barriers

Athletes often do not tell staff about menstrual symptoms. In Findlay et al. (2020), several international players were reluctant to confide in coaches, some found it harder to talk to male staff, and 3 of 15 had no one they felt comfortable talking to. A clinician who never asks will see unexplained absences and variable performance, and will not know why.

4.6 Distorted outcome testing

Return-to-sport decisions rely on strength tests, hop tests and patient-reported outcomes. Testing on a high-symptom day can underestimate true capacity through pain, fatigue or low motivation. McNulty et al. (2020) found only a trivial early follicular reduction in performance at group level, but individual variation was large, and the authors recommended an individualised approach. For a symptomatic athlete, the testing day may matter as much as the programme.

Table 2. Proposed pathways linking menstrual symptoms to rehabilitation adherence and recovery

Symptom	Adherence or recovery mechanism	Likely consequence	Evidence strength
Pain (dysmenorrhoea)	Heightened pain reactivity; lower tolerance for loaded exercise	Reduced intensity; skipped home exercises	Moderate for pain sensitivity; indirect for adherence
Fatigue; heavy bleeding	Lower work capacity; possible iron deficiency	Shortened sessions; poor progression	Strong for prevalence; indirect for rehabilitation

Symptom	Adherence or recovery mechanism	Likely consequence	Evidence strength
Mood change, anxiety	Lower self-efficacy and belief in treatment	Reduced motivation; drop-out risk	Strong for adherence predictors; indirect link
Any recurring symptom	Predictable absence on symptom days	Missed clinic sessions	Moderate (training availability data)
Reluctance to disclose	Clinician cannot adapt the programme	Absence logged as non-adherence	Qualitative evidence
Symptoms on test day	Underestimated performance	Delayed or inaccurate return-to-sport decisions	Theoretical; supported by individual variability

5. A Symptom-Informed Rehabilitation Model

The model below aims to keep athletes engaged on symptomatic days instead of losing those days altogether. It costs little, needs no specialist equipment and fits into existing sports physiotherapy practice. It also follows wider calls to personalise physical therapy to each woman's menstrual cycle (Васильцова, 2022).

5.1 Screen at intake

1. Record cycle length, regularity, contraceptive method and the usual timing and duration of symptoms.
2. Score symptoms with a structured tool, such as the Menstrual Symptom index (MSi), which rates 18 common symptoms on a 0–54 scale (Bruinvels et al., 2021).
3. Screen for heavy menstrual bleeding with simple questions on flooding, changing protection overnight and passing large clots.
4. Check ferritin and haemoglobin in athletes with heavy bleeding, persistent fatigue or a history of anaemia.
5. Refer severe pain, very heavy bleeding, or absent or irregular periods for medical review.

5.2 Plan sessions around symptoms

Rather than cancelling sessions, clinicians can prepare a lower-demand alternative for predictable symptom days. Table 3 gives examples.

Table 3. Symptom-responsive session options

Symptom profile	Keep	Modify	Defer
Mild symptoms	Full programme	Extra warm-up; check pain with a 0–10 scale	Nothing
Moderate pain or cramps	Upper-body, core and contralateral-limb work; neuromuscular drills	Reduce load on painful exercises by 10–20%; use isometrics for analgesia	Maximal strength testing; new high-load exercises
Marked fatigue	Technique, balance and proprioceptive work	Shorter session with longer rest; lower volume	High-volume conditioning; fatiguing plyometrics
Low mood, anxiety	Familiar exercises with clear success criteria	Emphasise progress already made; set small goals	Benchmark tests that may be read as failure
Unable to attend	A short, pre-agreed home programme	Remote check-in by message or video	Re-book the missed session within the same week

Note. The options are suggestions and should be adjusted to injury type, rehabilitation stage and athlete preference.

5.3 Test on a low-symptom day

Schedule key strength, hop and return-to-sport tests away from each athlete's known high-symptom days. Record cycle day and symptom score alongside every test result, so that variation can be interpreted rather than mistaken for regression.

5.4 Normalise the conversation

Ask about menstrual symptoms routinely and in a matter-of-fact way at intake and review. Offer the option to report symptoms by message or app rather than face to face, and to speak with a female staff member where possible. When athletes know that symptom days will be adapted rather than recorded as failure, disclosure becomes easier.

5.5 Measure adherence properly

Use an attendance ratio (sessions attended divided by sessions scheduled) and the Sport Injury Rehabilitation Adherence Scale (SIRAS) for in-session effort, both widely used in adherence research (Goddard et al., 2020). Record the reason for every missed session. Separating symptom-related absence from other causes helps the clinician target the right solution.

6. Discussion

The evidence shows that menstrual symptoms are common, predictable and often under-treated in female athletes. It also shows that adherence depends on attendance, effort, self-efficacy and belief in treatment. What the literature lacks is direct study of the link between the two. This gap is itself a finding: rehabilitation research has not measured one of the most common physical experiences of its female participants.

The pathways in Table 2 suggest that the effect is unlikely to be dramatic in any single month. Instead, small recurring losses in attendance and effort may accumulate across a long programme. For ACL rehabilitation, where only about half of athletes return to competitive sport (Ardern et al., 2014), even modest gains in adherence could matter.

The proposed model has a further benefit: data quality. Recording cycle day and symptoms alongside test results lets clinicians separate true recovery from symptom-related noise, improving the accuracy of return-to-sport decisions.

6.1 Limitations

- **No direct cohort data.** The links between menstrual symptoms and rehabilitation adherence are inferred from separate bodies of evidence and need direct testing.
- **Self-selected samples.** Prevalence surveys may over-represent women with symptoms.
- **Hormonal contraception.** Users of different methods experience different symptom patterns, which are often grouped together in studies.
- **Adherence measurement.** Adherence measures vary between studies, and some lack sensitivity to change (Goddard et al., 2020).
- **Generalisability.** Most data come from high-income countries and from runners, rugby and track athletes.

6.2 Priorities for research

1. Prospective cohorts of injured female athletes that record daily symptoms, session attendance, SIRAS scores and functional outcomes.
2. Trials comparing symptom-informed rehabilitation with usual care, using return-to-sport rate and adherence as outcomes.
3. Studies of iron status and fatigue during long-term rehabilitation.
4. Research on how clinician sex, communication style and reporting tools affect symptom disclosure.

7. Conclusion

Menstrual symptoms affect most exercising women and plausibly reduce rehabilitation adherence through missed sessions, reduced effort, lower self-efficacy and misleading test results. These effects are predictable and largely preventable.

Clinicians can act now:

1. Screen every female athlete for menstrual symptoms, heavy bleeding and iron status.
2. Prepare symptom-day alternatives instead of cancelling sessions.
3. Test progress on low-symptom days and record cycle day with every result.
4. Ask routinely and make disclosure easy.

Treating menstrual symptoms as a normal part of rehabilitation planning, rather than an unspoken barrier, is a simple step towards better adherence and fairer recovery outcomes for female athletes.

Declarations

Conflict of interest. The author declares no conflict of interest.

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