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Menstrual-Cycle-Aware Training: A Synthesis of the Performance, Symptom, and Health Evidence Base (2024–2026)

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Abstract

Background: There is still a debate surrounding how the menstrual cycle (MC) affects female athletes and a growing number of high-quality studies have been published in the last three years (2024-2026). The purpose of this paper is to review the latest (2024-2026) peer-reviewed literature and summarize the evidence regarding the link between MC phase, hormonal contraceptive use, athletic performance, symptom burden, and injury risk, as well as applied training practice. Methods: A structured narrative and scoping review was performed across PubMed, Scopus, Web of Science, SPORTDiscus and Frontiers, using a framework similar to that used in PRISMA screening and restricting publications to January 2024 to the early part of 2026. The findings: When high methodological standards are applied to systematic reviews, the effect of MC phase on objectively measured strength, power and endurance performance is trivial-to-small and mostly inconsistent. In contrast, symptom prevalence, perceived exertion, and self-reported performance impact are large, consistent, and athlete-relevant and impact a majority of surveyed athletes. The use of hormonal contraceptives is a unique and different physiological profile, making the pooled analyses difficult. Variations in injury-risk surrogates, in particular for anterior cruciate ligament, are phase linked and iron deficiency is under-recognized as a performance limiting factor associated with heavy menses. Conclusion: The evidence base still supports individualized, symptom-driven management of athletes over the use of strict phase-based training protocols, and shows continued methodological weaknesses; notably, the lack of consistent hormonal verification of the primary literature.

Keywords: Menstrual Cycle, Female Athletes, Athletic Performance, Hormonal Contraceptives, Injury Risk.

1. Introduction

Over the last 40 years, there has been a significant increase in women's involvement in sports, in both competitive and recreational settings and, consequently, in the scientific and public research of women-specific physiology, such as the menstrual cycle (MC). Traditionally, research in exercise science has been performed almost exclusively in males and the hormonal differences that exist among females are often ignored, controlled for, or excluded from their investigation. This has resulted in coaches, athletes and practitioners having a relatively weak and limited evidence base to inform their practical training advice.

This divide was slowly closing between 2024-2026. The number of systematic reviews, longitudinal cohort studies, randomized and quasi-experimental trials, and applied implementation studies have grown, providing a more comprehensive evidence base regarding the effect of — and the question of whether the MC has an effect on — training capacity, competitive performance, symptom burden, injury risk, and long-term athlete health (Schlie et al., 2025; Elorduy-Terrado et al., 2025; Oester et al., 2024). During this time, there has been increasing focus on the unique nature of hormonal contraceptive use, separate from the naturally cycling MC (Seidman et al., 2024; Engseth et al., 2025), and a renewed interest in applied monitoring and coach-education strategies (Carmichael et al., 2024, 2025; Roffler et al., 2024). While the question of whether the menstrual cycle in a meaningful way influences training capacity and/or competitive performance remains quite simple, the answer is "yes" and "yes". In some cases, commercial and media interest outstripped the evidence base for “cycle syncing” with popular methods suggesting high and predictable performance windows on specific days of the cycle. The most recent systematic reviews paint a more complex picture: objective measures of strength, power and endurance capacity change trivially over the course of the cycle at the group level, while perceptual, symptomatic and psychological measures indicate much larger and more consistent fluctuation.

This paper summarizes only literature from 2024-2026, with the aim of (1) characterizing the physiological framework and methodological state of the field, (2) quantifying pooled effect directions for objective performance outcomes, (3) quantifying symptom prevalence and perceived performance impact, (4) studying hormonal contraceptive effects as a separate variable, and (5) examining injury risk, iron status, and applied monitoring practice. The paper is designed to be a complete research synthesis, including tables for summarizing findings and providing interpretation, to facilitate a discussion based on the evidence rather than on anecdotes, about this growing body of knowledge in the field of women's sports science.

2. Literature Review

2.1. Hormonal Physiology and Methodological Verification of the Menstrual Cycle

The MC is a cycle of approximately 28 days in length, which is a sequence of the follicular phase and the luteal phase, influenced by the changes of estradiol, progesterone, luteinizing hormone and follicle stimulating hormone. These hormones have broad non-reproductive physiological effects including the regulation of thermoregulation, fluid balance, substrate utilization, connective tissue laxity and central nervous system excitability. Finally, methodological quality of phase verification in the literature remained significantly variable in 2024-2026; a recent systematic review with high methodological standards demonstrated significant challenges in comparing studies based on phase verification alone when it is not based on actual sex-hormone measurement (Schlie et al., 2025). The confidence of the scientific community in MC-performance links has also varied with time, following the methodological quality of the review articles, and not with the discovery of new mechanisms (a related historical-perspective review, tracing review articles from 1984–2024, also concluded this, Hackney et al., 2025).

Inconsistent hormone confirmation continues to be the biggest limitation in the field, as evidenced by two reviews published in 2025. Adopting the PRISMA guidelines by the groups of Elorduy-Terrado et al., (2025) in Scopus, Web of Science and PubMed revealed that there is a potential link between hormonal events and performance, although the evidence across the literature was inconsistent, highlighting the need for more rigorous and standardized methods to verify the phase. In a scoping review of MC monitoring in applied sport settings, Carmichael et al. (2025) also found inconsistency among tracking tools and low-burden verification methods to be common barriers to implementation.

2.2. Menstrual Cycle Phase and Objectively Measured Athletic Performance

2024-2026 systematic reviews generally conclude that MC phase has at most, a small-to-trivial effect on objective measures of strength, power and endurance performance. By applying strict methodological inclusion criteria, Schlie et al. (2025) found that maximum isometric strength testing found no consistent of differences in strength between phases, whereas isokinetic strength testing did, with increased strength being measured in the Down phase compared to the Up phase. They also reported no consistent differences in strength between phases from either eight of the nine studies they included, or from the five studies that tested jump height. Only two of five studies reported any differences in countermovement jump performance between phases.

This is also reflected in the sport-specific findings. In elite handball players, the oral contraceptive cycle had only a small effect on the parameters of maximal and submaximal endurance (Mathy et al., 2024). However, in competitive cyclists, MC phase did not significantly change the power profile during typical and standardized submaximal training rides (Emslie et al., 2024) and in trained women exposed to acute hypobaric hypoxia at 4,000 m, MC minimally affected cardiorespiratory function and body-balance control (Rotllan et al., 2025). In a similar study of trained female cyclists, the researchers determined that measures of recovery after exercise were better influenced by the MC phase than by HIIT performance itself (Righi & Barroso, 2026), and a more comprehensive review of the literature spanning 2026 found that symptoms and nutritional status were more likely to influence performance outcomes than was MC phase (Natalucci et al., 2026). Thermoregulatory responses are similar; a 2025 study in a heat chamber showed that a 2025 walking exercise to similar intensity and duration in the uncommendable heat gain condition resulted in only modest differences between the MC phase and the core temperature and rated perceived exertion condition, which were not sufficient to significantly change overall thermoregulatory capacity (Christison et al., 2025).

2.3. Symptom Burden, Perceived Exertion, and Psychosocial Impact

Symptom prevalence and perceived impact on performance exhibit significantly greater and more stable cycle variation as compared to objective performance. A 2024 longitudinal study of elite British track and field athletes identified that over three-quarters of athletes (76.8%) experienced a negative effect on their performance from their cycle, with 79% experiencing one or more cyclical symptoms, most of which were bloating, lower back or pelvic pain (Jones et al., 2024). Fifty percent of those reporting a negative impact saw the late luteal phase and 35% the early follicular phase the most affected.

Higher MC levels were perceived as having more impact during training compared to competition, in the majority of studies included in the scoping review (Oester et al., 2024) – this was believed to be due to the focus on competition days over symptom awareness and that elite athletes are more likely to normalize or tolerate pain while training. The same is true of the self-report of negative MC symptoms, which appear in a greater number than daily monitoring, because of the recall bias (Badier et al., 2025) but do noticeably impact well-being and training and competition performance. The outcomes of sleep and recovery demonstrate a related pattern: A season-long longitudinal study of elite female basketball athletes revealed that occurrence of individual symptoms was the better and more consistent predictor of poor sleep quality and recovery-stress states, as opposed to MC phase (Kullik et al., 2025). The distinction of phase-driven versus symptom-driven effects is seen repeatedly in the literature over the next 3 years (2024-2026) and it has implications on how athlete monitoring should be designed.

2.4. Hormonal Contraceptives as a Distinct Performance Variable

The use of the hormonal contraceptive (HC) is now viewed in the recent literature as a physiologically different from the naturally cycling MC, and not just a confounder to be subtracted. While there are legitimate concerns about physical performance, musculoskeletal injury risk, and bone density with the use of oral contraceptives, it is safe to use oral contraceptives in active women and there is emerging evidence that there may be a protective association with the risk of ACL injury.

Among the 2025 season-long study of female endurance athletes, FENDURA, the athletes' self-reported severity of symptoms and recovery differed significantly across phases of the natural MC and HC cycles, although there was a meaningful difference between athletes who naturally cycled and those who used HC cycles (Engseth et al., 2025). Similarly, a clustering-analysis study of elite female cyclists' training responses in 2024 found that training-response clustering was different among females taking combined oral contraceptives (MC) compared to the naturally cycling MC. Langan-Evans et al. (2024) showed at the population level that there was great variation in HC use, in MC characteristics, and in the training/nutrition profile between elite, sub-elite and amateur athletes, and suggested that "one size is unlikely to fit all" when creating training guidance that is HC-aware. Delivering a 2025 narrative review, Pierudzka et al. (2025) also identified HC-associated changes in gut-microbiome composition as a potential though under-explored mechanism for the effects of HC use on exercise-induced physiological adaptation, suggesting that the performance-relevant effects of HC use may not be limited to the reproductive hormone axis.

2.5. Injury Risk, Iron Status, and Relative Energy Deficiency

As of 2024–2025, injury epidemiology studies have continued to confirm disproportionately high risk of injury for female athletes compared to male athletes in all types of sport settings; for example, a large systematic review and meta-analysis of injury risk by athlete participant-classification framework found that there were significant sex differences in injury profiles (Hardaker et al., 2024). A sport-specific analysis, e.g., a recent review of the role of hormonally-regulated ligament laxity around the time of ovulation as a possible factor contributing to higher rates of non-contact ACL injuries (Leyes & Jácome, 2025), also supports that ligament laxity may be one of the causes, but methodological variability in phase verification persists, reducing the certainty of this conclusion.

Iron status has become a unique and actionable issue. A 2025 exploratory study which directly measured menstrual blood loss in eumenorrheic footballers showed that the loss of menstrual blood causes measurable hematological and iron-regulatory effects, with early follicular phase ferritin and haemoglobin levels approaching thresholds for sub-optimal iron status, making heavy menstrual bleeding a risk factor for performance that can be modified, rather than just a gynecological concern. This is in line with the family of relative energy deficiency in sport (RED-S) where menstrual dysfunction is one of the most obvious and early clinical signs of chronic low energy availability (Grabia et al., 2024).

The coach education and applied monitoring, cycle tracking, and the 2.6 aspects of cycling are also being covered.

A developing body of applied literature focuses on the collection, interpretation and actions taken in the real training environment in relation to MC information. Carmichael et al. (2024) surveyed coaches, support staff, and athletes to identify six priority areas for implementation: ethics, tracking tools and methods, performance and health, education, interpretation/framing, and communication. In a 2025 scoping review, their work was extended to find that use of low-burden tracking methods in combination with structured menstrual-health education leads to increased uptake and practical impact (Carmichael et al., 2025).

The promise and limitations of this approach can be demonstrated with field-based tracking studies: a recent field-based study of professional volleyball athletes and a commercial tracking app was able to characterize in-season frequency and intensity of symptoms throughout a complete season of a national-league competition (Roffler et al., 2024). Ethical-risk analyses were published at the same time, however, which highlight the potential for breaches of privacy, consent and the extent to which coaches can access intimate health data when there is systematic tracking of menstruation in sport (Howe, 2024), and broader sociocultural reflections on the way menstrual data is presented and applied in sporting contexts (King, 2025). Qualitative studies also support the concept of this applied approach; in a study of competitive female cyclists (Burnie et al., 2026), a low-pressure framing and building of trust with coaches helped most athletes embrace open discussion with coaches about MC-related training changes. Accuracy of basal body temperature measurement is still a practical constraint on any tracking system: two reports from 2026 comparing the effectiveness of various sites and timing for measurement of BBT in recreational athletes found that measurement site and timing significantly influences the reliability of BBT measurement, and thus, even simple, low cost tracking tools require careful protocol design to be useful (Nolte, J., et al., 2026).

3. Methodology

The paper utilizes a structured narrative and scoping review method which is suitable to synthesize a diverse and emerging evidence base, including systematic reviews, randomized trials and quasi-experimental studies, as well as longitudinal cohort studies, cross sectional surveys and applied implementation research. Given that the goal was to map the extent of the recent evidence in the performance, symptom, contraceptive, injury, and applied-practice domains, rather than to pool just one quantifiable effect estimate, a scoping approach was chosen.

The databases Pubmed, Scopus, Web of Science, SPORTDiscus and Frontiers journal indices were searched with combinations of the terms: ("menstrual cycle" OR "menstrual phase" OR "hormonal contraceptive") AND ("athletic performance" OR "training" OR "exercise" OR "sport") AND ("strength" OR "endurance" OR "injury" OR "symptom" OR "iron" OR "monitoring"). As is typical in scoping reviews, handsearching of reference lists of identified reviews followed for the purpose of identifying other potentially eligible primary studies.

Table 1: Eligibility Criteria Applied to the 2024–2026 Literature Synthesis**.**

Criterion	Specification
Publication window	January 2024 – February 2026
Population	Eumenorrheic and hormonal-contraceptive-using female athletes and exercising women (recreational to elite)
Study types included	Systematic reviews/meta-analyses, RCTs and quasi-experimental trials, longitudinal cohorts, cross-sectional surveys, scoping reviews, applied implementation studies
Exclusions	Male-only samples; animal/in-vitro models; non-peer-reviewed commercial content; studies published before 2024
Outcome domains	Objective performance (strength/power/endurance), symptom prevalence, perceived performance impact, hormonal contraceptive effects, injury risk, iron/RED-S status, applied monitoring

Information was extracted for each eligible study for the following: year of publication, study design, study characteristics, method used to verify the MC-phase, domain of the outcome, direction and magnitude of the reported effect, and stated methodological limitations. Results were subsequently summarized thematically according to the five outcome domains of the Literature Review: objective performance, symptom/perceptual burden, effects of hormonal contraceptive, injury/iron status, and applied monitoring practice. Included studies were of very diverse design and outcome measures, so no formal meta-analysis pooling was attempted, but instead, the directionality of the studies within each domain was used as the initial basis for the interpretive summaries presented in Section 4. Given the methodological criticism provided in the included literature, an effort was made to distinguish between the use of self-report or calendar counting for MC determination and the use of hormone assays (serum, saliva, or urine) in primary studies. This distinction was found to be one of the main reasons for inconsistencies across studies (Schlie et al., 2025; Elorduy-Terrado et al., 2025). Studies using only calendar based phase estimation were included, but marked as less-confident evidence in the synthesis.

4. Results

4.1. Overview of Included Evidence

Table 2 summarizes the primary studies and reviews included in this synthesis, organized by outcome domain, together with their key quantitative or directional findings.

Table 2: Summary of Key 2024–2026 Findings by Outcome Domain.

Domain	Study	Key Finding	Interpretation
Objective performance	Schlie et al. (2025)	No consistent phase effect on max strength (8 studies); 2/5 studies found a CMJ phase effect	Trivial-to-small, inconsistent effect on strength/power
Objective performance	Mathy et al. (2024)	Limited HC-cycle influence on endurance parameters in elite handball players	Endurance largely insensitive to cycle phase
Objective performance	Emslie et al. (2024)	No meaningful power-profile change across MC phase in cyclists	Supports trivial effect in cycling power output
Objective performance	Righi & Barroso (2026)	Recovery affected more than acute HIIT performance across phases	Perceptual/recovery sensitivity exceeds performance sensitivity
Symptom/perceived impact	Jones et al. (2024)	76.8% reported negative perceived impact; 79% reported ≥1 cyclical symptom	Large, prevalent perceived performance impact
Symptom/perceived impact	Oester et al. (2024)	Higher-level athletes report greater training (vs. competition) impact	Perceived impact is context- and level-dependent
Symptom/perceived impact	Kullik et al. (2025)	Symptom frequency (not phase) predicts sleep/recovery disruption	Symptom burden is the operative mechanism, not phase per se

Domain	Study	Key Finding	Interpretation
Hormonal contraceptives	Engseth et al. (2025)	Symptom severity/recovery differ by natural vs. HC-cycle phase	HC use requires separate analytic treatment from natural MC
Hormonal contraceptives	Langan-Evans et al. (2024)	HC use and MC characteristics vary widely by competitive level	No uniform HC-aware training template is appropriate
Injury/iron/RED-S	Hardaker et al. (2024)	Substantial sex differences in injury profiles across sport	Female athletes carry elevated, sport-modulated injury risk
Injury/iron/RED-S	Nolte, S., et al. (2025)	Ferritin/haemoglobin near suboptimal thresholds in early follicular phase	Menstrual blood loss is a measurable, modifiable performance risk
Applied monitoring	Carmichael et al. (2024, 2025)	Six priority domains identified for MC-tracking implementation	Structured, ethical, low-burden tracking improves uptake

Source: Synthesized from the studies cited in Section 2 (Literature Review), all published 2024–2026.

The central pattern in the literature for the last three years (2024-2026) is captured in Table 2, in which symptom, perceptual, and recovery measures tend to cluster towards large and consistent effects, with objective performance measures tending to cluster towards null or trivial effects. The use of hormonal contraceptives and injury/iron outcomes are two other areas that are physiologic and clinical categories and do not merely extend the question of performance in the natural cycle.

4.2. Objective Performance Outcomes Across Phases

Table 3: Directional Summary of Objective Performance Findings, 2024–2026.

Study	Outcome Tested	Direction of Effect	Verification Method
Schlie et al. (2025)	Max isometric/isokinetic strength	No consistent difference	Mixed; high-standard subset only
Schlie et al. (2025)	Countermovement jump height	Effect in 2/5 studies	Mixed
Mathy et al. (2024)	Maximal/submaximal endurance	Limited influence	Serum hormone-confirmed
Emslie et al. (2024)	Submaximal cycling power profile	No meaningful change	Calendar-based
Rotllan et al. (2025)	Cardiorespiratory function at altitude	Minimal effect	Serum hormone-confirmed
Righi & Barroso (2026)	HIIT performance vs. recovery	Recovery affected more than performance	Calendar-based, verified bleeding onset

Source: Schlie et al. (2025); Mathy et al. (2024); Emslie et al. (2024); Rotllan et al. (2025); Righi & Barroso (2026).

Across six independent objective-performance investigations spanning strength, jump, endurance, cycling power, and altitude tolerance, only isolated and inconsistent phase effects emerge (2 of 5 jump studies in one review; no consistent finding elsewhere). This pattern held regardless of whether phase was confirmed via serum hormone assay or calendar estimation, suggesting that the trivial-effect conclusion is not simply an artifact of weak phase verification. Recovery-oriented outcomes, however, appear more consistently phase- and symptom-sensitive than acute performance capacity itself.

There was no significant difference reported in menstrual-cycle phase for none of the eight included maximal isometric/isokinetic strength studies. There were five studies that tested explosive strength using countermovement jump height, of which two reported a significant difference with one representative study indicating a jump height that was around 6% higher in the mid-luteal (23.1 cm) than in the late-luteal phase (21.8 cm) (Schlie et al., 2025). This asymmetry (explosive/neuromuscular measures more phase-sensitive than maximal force measures) is repeated throughout the broader literature from 2024-2026.

4.3. Symptom Prevalence and Perceived Performance Impact

Table 4: Symptom Prevalence and Perceived Impact Statistics, 2024–2026.

Study / Cohort	Symptom or Impact Measure	Reported Rate	Population
Jones et al. (2024) — British track & field	Negative perceived performance impact	76.8%	128 elite athletes, 5-yr longitudinal
Jones et al. (2024)	≥1 cyclical symptom reported	79%	Same cohort
Jones et al. (2024)	Dysmenorrhoea	68%	Same cohort
Jones et al. (2024)	Menorrhagia (heavy bleeding)	31%	Same cohort
Oester et al. (2024)	Greater impact during training vs. competition	Majority of included studies	Scoping review, multiple cohorts
Badier et al. (2025)	Symptoms affecting well-being/performance	Elevated on retrospective vs. daily report	Elite French athletes
Kullik et al. (2025)	Poorer sleep/recovery on high-symptom days	Significant association	Elite basketball, season-long

Source: Jones et al. (2024); Oester et al. (2024); Badier et al. (2025); Kullik et al. (2025).

There is a highly consistent pattern when looking at either perceived or symptom-based measures across studies of independent athlete cohorts—approximately three-quarters to four-fifths of the sampled elite athletes report at least one cyclical symptom, or a subjectively adverse effect on their performance. Most importantly, Kullik et al. (2025) show that the frequency of symptoms, not the cycle phase itself is the statistically more powerful predictor for the recovery and sleep disruption experienced downstream, and thus the practical question should change from "which phase is this athlete in" to "how symptomatic is this athlete at this time?

Among athletes who identified a specific timing for their negative performance impact, the late luteal (40%) and early follicular (35%) phases together account for three-quarters of reported cases — consistent with the physiological transition points around progesterone withdrawal and menstruation onset, and providing a concrete practical target for symptom monitoring even though objective performance measures do not show a matching phase pattern.

4.4. Hormonal Contraceptive Effects

Table 5: Hormonal Contraceptive Findings Relevant to Athletic Performance, 2024–2025.

Study	Comparison	Finding
Seidman et al. (2024)	OC use vs. injury/bone-density concerns	Generally safe; possible protective association with ACL injury risk
Engseth et al. (2025) — FENDURA	Natural MC vs. HC-cycle symptom severity	Distinct severity/recovery patterns by cycle type
Carlin et al. (2024)	Combined OC vs. natural MC training-response clustering	OC use alters training-response cluster patterns
Langan-Evans et al. (2024)	HC/MC profiles across competitive levels	Substantial variation; no uniform template appropriate
Pierudzka et al. (2025)	HC use and gut-microbiome composition	Plausible but underexplored adaptation-relevant mechanism

Source: Seidman et al. (2024); Engseth et al. (2025); Carlin et al. (2024); Langan-Evans et al. (2024); Pierudzka et al. (2025).

Hormonal contraceptive use cannot be treated as a simple variant of the naturally cycling MC. The 2024–2025 literature converges on the view that HC-using athletes constitute a physiologically and practically distinct subgroup, requiring separate monitoring and, potentially, separate training considerations rather than being pooled indiscriminately with naturally cycling athletes in either research or applied practice.

4.5. Injury Risk, Iron Status, and RED-S

Table 6: Injury Risk and Iron/RED-S Findings, 2024–2025.

Study	Focus	Key Result
Hardaker et al. (2024)	Sex-based injury profile differences	Substantial, sport-modulated elevated risk in female athletes
Leyes & Jácome (2025)	ACL injury in female football	Ovulatory-phase laxity remains a plausible contributor; verification limits certainty
Nolte, S., et al. (2025)	Menstrual blood loss and iron metabolism	Ferritin/haemoglobin approach suboptimal thresholds in early follicular phase
Grabia et al. (2024)	RED-S nutritional management	Menstrual dysfunction is an early, actionable RED-S marker

Source: Hardaker et al. (2024); Leyes & Jácome (2025); Nolte, S., et al. (2025); Grabia et al. (2024).

The results of the injury and metabolic-health findings suggest that two practical targets for practitioners can be identified, namely monitoring markers of ACL-injury risk around the ovulatory window for sports with a high exposure to non-contact ACL injuries and proactively screening for iron status for athletes reporting heavy menstrual bleeding, as the effect on the hematological system is measurable even before clinical anaemia has set in.

The mean ferritin concentration in early follicular phase was 37.83 ± 23.08 ng/mL and the mean haemoglobin level was 12.05 ± 0.86 g/dL (Nolte, S., et al., 2025). The group mean and, importantly, the lower end of the ferritin distribution was close to commonly used suboptimal-iron-store thresholds, and mean haemoglobin was close to the threshold for anaemia in adults (12.0 g/dL) as defined by the WHO, even though no formal diagnosis of anaemia had been made for a significant proportion of eumenorrheic athletes in the sample.

4.6. Applied Monitoring and Implementation

Table 7: Applied Monitoring and Implementation Findings, 2024–2025.

Study	Implementation Focus	Key Result
Carmichael et al. (2024)	Concept mapping with coaches/athletes	Six priority domains: ethics, tools, performance/health, education, framing, communication
Carmichael et al. (2025)	Scoping review of MC monitoring	Low-burden tracking + education improves uptake and impact
Roffler et al. (2024)	In-season app-based tracking, volleyball	Successfully characterized in-season symptom patterns

Study	Implementation Focus	Key Result
Howe (2024)	Ethics of systematic tracking	Flags privacy, consent, and scope-of-practice risks

Source: Carmichael et al. (2024, 2025); Roffler et al. (2024); Howe (2024).

The applied-practice literature is united in its recommendation that tracking should be minimal, focused on the athlete, accompanied by a well-defined educational program for the athlete and the coach, and accompanied by clear consideration of data privacy and consent — not be imposed as a mandating down-top requirement.

5. Discussion

The 2024-2026 evidence base does not change the ongoing debate on whether training should be menstrual-cycle-aware.The 2024-2026 evidence base does not resolve the longstanding debate on whether training should be menstrual-cycle-aware, it clarifies. Phase-related differences are only trivial and inconsistent when looking at objectively assessed strength, power, and endurance performance (Schlie et al., 2025; Mathy et al., 2024; Emslie et al., 2024; Rotllan et al., 2025). This is consistent with the overall historical trend reported by Hackney et al. (2025), which is that as the methods used have become more rigorous (especially using hormones for phase verification) so has the confidence in strong MC-performance relationships.

In contrast, symptom burden and perceived impact on performance are large, common, and athlete relevant, with approximately three-quarters of athletes with longitudinal cohorts reporting an athlete-relevant subjectively negative cycle impact on performance (Jones et al., 2024). A very important reframing that Kullik et al. 2025 brought forward, was that the greater the frequency of the symptoms, the greater the chances for downstream recovery and sleep disturbance. This implies that the practically useful question for coaches and athletes is not what day of the cycle is it, but rather, how symptomatic does this athlete feel today, which has direct implications on the design of monitoring systems.

In the recent literature, hormonal contraceptive emerges as a separate, instead of just a confound, variable. Engseth et al. (2025) and Carlin et al. (2024) both found that the severity of HC-cycles is different to natural MC-cycles, and that there is clustering around severity in HC-cycles that are different to that of natural MC-cycles; and Langan-Evans et al. (2024) found that there is a significant variation in HC use as well as MC characteristics across competitive levels, in terms of defensibility of a single training template. This has obvious design considerations as participants with HC use and those who cycle would be combined together without stratification, which could mask true effects in either direction, but also important applied practice implications, as general “cycle syncing” recommendations may be actively unhelpful for the large number of athletes on HC.

The more recent evidence also shows that there are other areas, such as injury risk and metabolic health, where there is clear evidence for action that is separate and apart from the overall performance conversation. Despite the causal association between ligament laxity in the ovulatory phase and ACL injury being not completely verified (Leyes & Jácome, 2025), the increased baseline sex-based ACL injury risk reported by Hardaker et al. (2024) warrants continued injury-prevention focus on the ovulatory phase in sports with a higher ACL injury risk. Likewise, Nolte, S., et al. (2025) directly demonstrated that menstrual blood loss is measurable and has a significant impact on iron status independent of diagnosed anaemia, which further supports the inclusion of menstrual health screening as a viable, low cost prevention strategy for RED-S (Grabia et al., 2024).

Lastly, the applied-implementation literature coalesces around a similar, medium claim: structured, non-burdensome, ethically implemented MC monitoring – coupled with coach and athlete education – leads to meaningful uptake and application of cycle-aware practices (Carmichael et al., 2024, 2025; Roffler et al., 2024); and, for the same reasons, actual threats to privacy and consent must not be taken for granted and must be managed (Howe, 2024; King, 2025).

5.1. Limitations

Hormone verification is inconsistently provided in primary studies, and even during the 2024-2026 period, some studies included had hormone phase estimation using a calendar method instead of serum confirmation. Mechanistic studies (iron-metabolism, hypoxia, cycling-power, etc.) continue to have small samples (often $n < 15$), with poor statistical power and generalizability. The data on symptoms and perceived impact are mostly self-reported and retrospective, which theoretically means that they suffer from recall and social desirability bias, as presented in the comparison of retrospective monitoring versus daily monitoring in Badier et al. (2025). There are a variety of different formulations of hormonal contraceptives (combined vs. progestin-only and dosage, as well as different generations) and most of the studies included in this review do not adjust for these different formulations, making it difficult to draw conclusions specific to each contraceptive.

5.2. Practical Implications

Combined, the evidence points to a shift in applied emphasis, moving away from the concept of phase periodization based on the calendar alone and towards individualized, symptom-driven management of athletes with (1) tracking of symptom severity and frequency, (2) consideration of athletes taking hormonal contraceptives and the need to monitor them separately, (3) routine screening for injuries and iron status that is independent of the larger performance discussion, and (4) an explicit focus on athlete privacy, consent, and educational support for both athletes and coaches when implementing the tracking program.

6. Conclusion

At the outset, the strongest and most consistent signals from the rapidly evolving evidence base of the 2024–2026 period are observed when examining the menstrual cycle and its effects on both symptom burden and perceived exertion and on injury-risk surrogates and iron status, with these areas showing large, prevalent, and athlete-relevant menstrual cycle effect sizes (Jones et al., 2024; Nolte, S., et al., 2025; Hardaker et al., 2024). The individualized, monitoring-based approach is thus the most defensible approach to menstrual-cycle-aware training, and the use of hormonal contraceptive should be considered a unique training variable in its own right (Engseth et al., 2025; Langan-Evans et al., 2024). When tracking implementation research is more advanced, coaches should take an individualized approach that is ethically sound, rather than relying on a one-size-fits-all prescription for a cycle.

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