



# International Journal of Innovative Technologies in Social Science

e-ISSN: 2544-9435

**Operating Publisher**  
**SciFormat Publishing Inc.**  
ISNI: 0000 0005 1449 8214

2734 17 Avenue SW,  
Calgary, Alberta, T3E0A7,  
Canada  
+15878858911  
editorial-office@sciformat.ca

## ARTICLE TITLE

THE IMPACT OF PHYSICAL ACTIVITY TYPE AND INTENSITY ON  
THE COURSE OF PMS: FROM THE THERAPEUTIC ROLE OF  
MODERATE EXERCISE TO THE RISKS ASSOCIATED WITH HIGH  
TRAINING WORKLOAD

## DOI

[https://doi.org/10.31435/ijitss.3\(51\).2026.6222](https://doi.org/10.31435/ijitss.3(51).2026.6222)

## RECEIVED

13 July 2026

## ACCEPTED

21 September 2026

## PUBLISHED

23 September 2026

## LICENSE



The article is licensed under a **Creative Commons Attribution 4.0 International License**.

© The author(s) 2026.

This article is published as open access under the Creative Commons Attribution 4.0 International License (CC BY 4.0), allowing the author to retain copyright. The CC BY 4.0 License permits the content to be copied, adapted, displayed, distributed, republished, or reused for any purpose, including adaptation and commercial use, as long as proper attribution is provided.

# THE IMPACT OF PHYSICAL ACTIVITY TYPE AND INTENSITY ON THE COURSE OF PMS: FROM THE THERAPEUTIC ROLE OF MODERATE EXERCISE TO THE RISKS ASSOCIATED WITH HIGH TRAINING WORKLOAD

**Justyna Bury** (Corresponding Author, Email: justyna.bury77@gmail.com)

Medical University of Silesia in Katowice, Poland

ORCID ID: 0009-0001-4778-2375

**Aleksandra Papuga**

Independent Public Health Care Facility in Myślenice, Poland

ORCID ID: 0009-0003-6851-7102

**Makary Hejduk**

Independent Public Health Care Facility in Myślenice, Poland

ORCID ID: 0009-0004-7579-4471

**Magdalena Grzymek**

The University Hospital in Cracow, Poland

ORCID ID: 0009-0000-4337-0261

**Katarzyna Kraska**

Medical Center in Łańcut Sp. z o.o., Poland

ORCID ID: 0009-0004-0464-6826

**Katarzyna Pawluczka**

Jagiellonian University Medical College, Cracow, Poland

ORCID ID: 0009-0001-4273-6599

**Aleksandra Pawluczka**

St. John Grande Hospital of the Brothers Hospitallers of Saint John of God, Cracow, Poland

ORCID ID: 0009-0005-6765-9314

**Aneta Sobek**

Medical Center in Łańcut Sp. z o.o., Poland

ORCID ID: 0009-0002-6759-5419

**Joanna Kadluczka**

Ludwik Rydygier Specialist Hospital in Cracow, Poland

ORCID ID: 0009-0002-9347-0767

**Jan Potoniec**

Gabriel Narutowicz Municipal Specialist Hospital in Cracow, Poland

ORCID ID: 0009-0000-5282-7833

**Weronika Kępa**

Independent Researcher, Cracow, Poland

ORCID ID: 0009-0000-8378-9681

**Martyna Więclawek**

The University Hospital in Cracow, Poland

ORCID ID: 0009-0006-7956-9962

---

**ABSTRACT**

**Background:** Premenstrual syndrome (PMS) is characterised by cyclic somatic, emotional, and behavioural symptoms during the luteal phase. Physical activity is a potential non-pharmacological strategy, but its effects may depend on exercise type, intensity, and volume.

**Aim:** This narrative review aimed to discuss the impact of different physical activity types and intensities on PMS, emphasizing the therapeutic role of moderate exercise and risks of high training workloads.

**Materials and Methods:** A narrative literature review was conducted using PubMed/MEDLINE and Google Scholar (2015–2026). The search included randomized controlled trials, observational studies, reviews, and guidelines related to PMS/PMDD, aerobic exercise, resistance training, yoga, training load, low energy availability, and RED-S.

**Results:** Evidence suggests that regular physical activity reduces physical and psychological PMS symptoms (pain, fatigue, anxiety, low mood). The strongest evidence supports aerobic exercise and yoga; data on resistance training are limited. Regular, moderate activity appears most beneficial. Conversely, high training loads combined with insufficient caloric intake may lead to low energy availability, RED-S, menstrual dysfunction, and impaired health.

**Conclusions:** Regular, moderate physical activity adapted to individual tolerance is a useful supportive strategy in PMS management. Recommendations should consider symptom severity, menstrual health, training status, energy availability, and recovery. Further high-quality studies are required to establish optimal exercise protocols for women with PMS.

---

**KEYWORDS**

Premenstrual Syndrome, PMS, Premenstrual Dysphoric Disorder, PMDD, Physical Activity, Low Energy Availability, RED-S, Menstrual Health

---

**CITATION**

Bury, J., Papuga, A., Hejduk, M., Grzymek, M., Kraska, K., Pawluczka, K., Pawluczka, A., Sobek, A., Kadluczka, J., Potoniec, J., Kępa, W., & Więclawek, M. (2026). The impact of physical activity type and intensity on the course of PMS: From the therapeutic role of moderate exercise to the risks associated with high training workload. *International Journal of Innovative Technologies in Social Science*, 3(51). [https://doi.org/10.31435/ijitss.3\(51\).2026.6222](https://doi.org/10.31435/ijitss.3(51).2026.6222)

---

**COPYRIGHT**

© The author(s) 2026. This article is published as open access under the Creative Commons Attribution 4.0 International License (CC BY 4.0), allowing the author to retain copyright. The CC BY 4.0 License permits the content to be copied, adapted, displayed, distributed, republished, or reused for any purpose, including adaptation and commercial use, as long as proper attribution is provided.

---

## 1. Introduction

Premenstrual syndrome (PMS) encompasses cyclic somatic, emotional, cognitive, and behavioural symptoms that most commonly occur during the luteal phase of the menstrual cycle and resolve shortly after the onset of menstruation. The most frequently reported symptoms include irritability, mood swings, lethargy, anxiety, emotional tension, fatigue, sleep disturbances, breast tenderness, bloating, and physical aches. A more severe form of premenstrual disorders, premenstrual dysphoric disorder (PMDD), is characterised by the predominance of affective symptoms and marked impairment in daily functioning [1,2].

The significance of PMS is not limited to subjective discomfort during the late phase of the menstrual cycle. Premenstrual disorders represent a global public health issue, affecting a substantial proportion of women of reproductive age and leading to a significant economic burden associated with absenteeism and decreased work productivity. Large-scale epidemiological data indicate that symptoms related to the menstrual cycle account for a substantial loss of productive days annually, driven not only by total absence from work (absenteeism) but also, to a greater extent, by remaining at work while experiencing significant symptom-related inefficiency (presenteeism) [3]. Consequently, these disorders severely impact both professional performance and socioeconomic healthcare costs, reinforcing the urgency for effective non-pharmacological management strategies. Contemporary research indicates that premenstrual disorders may substantially reduce quality of life (QoL), even after accounting for comorbidities and sociodemographic factors. A population-based study conducted in Sweden showed that women with premenstrual disorders had poorer QoL compared with women without these disorders [4]. These observations reinforce the need to identify effective, safe, and acceptable strategies for alleviating PMS symptoms, particularly approaches that may be implemented as part of long-term management.

The etiology of PMS and PMDD is complex and has not been fully elucidated. Current concepts emphasise the role of central nervous system sensitivity to physiological fluctuations in ovarian hormones, particularly progesterone, estrogens, and their metabolites, as well as the involvement of neurotransmitter systems, including the serotonergic and GABAergic systems [1,5].

Although the therapeutic potential of exercise in managing premenstrual symptoms is well-recognized, its clinical application requires a nuanced approach that accounts for the parameters of physical workload. Emerging evidence indicates that the physiological responses to exercise are highly intensity-dependent, where moderate and consistent activity yields systemic benefits, whereas excessive training volumes may conversely stress the reproductive axis [6,7]. Consequently, identifying the threshold where physical activity ceases to be a non-pharmacological therapy and becomes a metabolic stressor is crucial for optimizing female athlete care [8,9]. This necessitates a comprehensive evaluation of how training parameters intersect with systemic physiological balance and recovery dynamics.

Current clinical recommendations for premenstrual disorders highlight the potential value of combining different therapeutic modalities, including pharmacotherapy, psychotherapy, patient education, nutritional interventions, and physical activity [1]. Exercise is a particularly interesting supportive strategy, as it may simultaneously influence both psychological and somatic symptoms of PMS. Studies and literature reviews have most commonly examined aerobic activity, yoga, stretching exercises, and resistance training [6,10].

Appropriate adjustment of energy intake to training load is of particular importance, as the high energy expenditure associated with training and athletic competition may lead to low energy availability (LEA) if it is not compensated for by adequate energy intake. In this context, the concept of Relative Energy Deficiency in Sport (RED-S) is relevant. RED-S is defined as a syndrome of physiological and psychological impairments occurring in athletes exposed to problematic low energy availability. RED-S may lead, among other consequences, to disturbances in reproductive function, impaired musculoskeletal health, immunity, energy metabolism, cardiovascular and haematological function, as well as reduced psychological well-being and exercise performance [8].

The aim of this narrative review is to discuss the effects of the type and intensity of physical activity on the course of PMS, with particular emphasis on the potential therapeutic role of moderate exercise and the risks associated with high training loads.

## **2. Materials and Methods**

This study constitutes a narrative review aimed at providing a comprehensive overview of the impact of physical activity type and intensity on the course of PMS, with particular emphasis on the potential therapeutic role of moderate exercise and the risks associated with high training workload.

The literature review was conducted using the PubMed/MEDLINE and Google Scholar databases. The search included publications published between 2015 and 2026. Combinations of keywords and Boolean operators (AND/OR) were applied, including: “premenstrual syndrome” OR “PMS”, “premenstrual dysphoric disorder” OR “PMDD”, “premenstrual symptoms”, “physical activity” OR “exercise”, “aerobic exercise”, “resistance training” OR “strength training”, “yoga”, “stretching”, “exercise intensity”, “training load”, “female athletes”, “menstrual cycle”, “menstrual dysfunction”, “low energy availability”, “relative energy deficiency in sport” OR “RED-S”, and “female athlete triad”. Additionally, the reference lists of selected articles were manually screened to identify relevant supplementary publications.

The inclusion criteria comprised randomized controlled trials, observational studies, systematic reviews, meta-analyses, narrative reviews, consensus statements, and current clinical guidelines published in English. Priority was given to publications indexed in PubMed and to articles published in journals of high scientific relevance. Publications were initially screened based on titles and abstracts, followed by full-text evaluation for relevance to the aim of the study.

Data synthesis was qualitative in nature and focused on comparing the effects of different forms and intensities of physical activity on PMS symptoms, as well as on discussing potential biological and psychological mechanisms, clinical implications, and risks related to excessive training load, low energy availability, and RED-S.

### 3. Results

#### 3.1 Clinical characteristics of PMS and potential mechanisms underlying the effects of physical activity on premenstrual symptoms

PMS comprises cyclic somatic and psychological symptoms that occur during the luteal phase of the menstrual cycle and resolve after the onset of menstruation. These symptoms should show a recurrent pattern and cause discomfort or impairment in daily functioning [1,11,12].

The most common physical symptoms of PMS include breast tenderness or pain, bloating, headache, musculoskeletal pain, weight gain, fatigue, sleep disturbances, and changes in appetite. Psychological symptoms primarily include irritability, mood lability, low mood, anxiety, restlessness, and difficulty concentrating [11,12].

It is important to distinguish PMS from PMDD. PMDD is a more severe form of premenstrual disorders, characterised by core symptoms such as marked irritability, depressed mood, anxiety, tension, and affective lability, as well as additional symptoms including fatigue, loss of interest, feeling overwhelmed, and physical symptoms [5,13]. PMDD is associated with significant impairment in functioning and quality of life. Owing to symptom severity and related clinical consequences, treatment often requires a multidisciplinary approach and the use of specialised therapeutic interventions [5].

Prospective monitoring of symptoms across consecutive menstrual cycles is of key importance in the diagnosis of PMS and PMDD. It enables verification of the temporal relationship between symptoms and specific phases of the menstrual cycle, assessment of symptom severity, and improved diagnostic accuracy. This approach facilitates differentiation of PMS and PMDD from coexisting psychiatric disorders and somatic conditions by evaluating the temporal association of symptoms with the menstrual cycle [1,13]. It also improves diagnostic precision by reducing the risk of misclassifying women with milder premenstrual symptoms or premenstrual exacerbation of existing affective disorders [13].

The pathophysiology of PMS and PMDD is multifactorial and remains incompletely understood. Current concepts suggest that, in many women, symptoms do not result from abnormal ovarian hormone concentrations, but rather from increased central nervous system sensitivity to physiological fluctuations in estrogen and progesterone occurring throughout the menstrual cycle [1,14]. A particular role has been attributed to progesterone and its neuroactive metabolite, allopregnanolone, which acts as a positive modulator of the GABA-A receptor and is involved in mood regulation. Dysregulation of the GABAergic and serotonergic systems, as well as altered regulation of the stress axis, may also play an important role in the pathogenesis of PMS and PMDD [1,5,14,15].

Physical activity is widely considered a valuable component in the management of premenstrual syndrome. The beneficial effects of regular exercise in reducing symptom severity are closely linked to its influence on various biological and psychological mechanisms, including endorphin release, the regulation of hormonal homeostasis, and the modulation of inflammatory processes [6,10]. Additionally, consistent physical activity exerts positive effects on mental health and sleep quality [16,17,18], as well as the maintenance of proper immunological balance [19]. It also supports psychological well-being by effectively mitigating symptoms of low mood and enhancing overall emotional resilience [6,10,17]. Given that systemic low-grade inflammation and elevated pro-inflammatory cytokines have been increasingly implicated in the severity of premenstrual physical distress, the exercise-induced shift towards an anti-inflammatory cytokine profile, as highlighted by Scheffer and Latini (2020) [19], provides a plausible biological pathway for mitigating somatic symptoms. Consequently, regular moderate physical activity may directly reduce peripheral manifestations such as breast tenderness, generalized muscle aches, and fluid retention [19,20]. For this reason, exercise is frequently included as a core element of non-pharmacological management in PMS; however, the available scientific evidence remains limited in its methodological quality [1,6].

#### 3.2 Forms of physical activity for the management of PMS symptoms

Physical activity is widely recommended as a non-pharmacological strategy for supporting women with PMS. Available evidence suggests that regular exercise may contribute to reducing the severity of psychological, physical, and behavioural symptoms, including low mood, irritability, anxiety, fatigue, pain, and other PMS-related complaints. The exercise programmes evaluated in the literature have varied considerably with respect to the type of activity, training frequency, intervention duration, and characteristics of individual exercise sessions [6,10,20].

The largest body of evidence concerns aerobic exercise, including brisk walking, running, swimming, and other forms of endurance training. Findings from studies included in a systematic review indicate that regularly performed aerobic exercise may alleviate PMS symptoms, particularly physical complaints, as well as certain psychological symptoms associated with the disorder [21]. Clinical studies have demonstrated precise quantitative benefits of structured aerobic regimens. An 8-week aerobic training programme involving 30 minutes of exercise 3 times per week was associated with a statistically significant reduction in specific physical symptoms, including headache, nausea, bloating, and breast tenderness [22]. Similarly, a 3-month swimming intervention consisting of 30-minute sessions performed 3 times weekly yielded a highly significant decrease in global PMS symptom scores, demonstrating clear efficacy in reducing physical pains and cramps, as well as core affective manifestations such as anxiety and depression [23].

Several mechanisms have been proposed to explain the beneficial effects of aerobic exercise on PMS symptoms, including increased endorphin concentrations, reductions in estradiol and cortisol levels, improved circulation, and modulation of sympathetic nervous system activity [20]. These beneficial effects appear to be most evident when aerobic exercise is performed on a regular basis [20,21].

Resistance training has been less extensively investigated in the context of PMS than aerobic exercise and yoga. Nevertheless, available evidence suggests that various forms of physical activity, including resistance training, may contribute to reducing the severity of selected premenstrual symptoms and improving both physical and psychological well-being. Consequently, resistance exercise may represent a valuable component of non-pharmacological management in women with PMS [10].

Mind-body interventions, including yoga, stretching, pilates, and breathing exercises, constitute another important category of physical activity. Among these interventions, yoga has been the most extensively studied. Evidence from systematic reviews and meta-analyses suggests that yoga may reduce the overall severity of PMS symptoms. Beneficial effects have been observed particularly for emotional and behavioural symptoms, while some studies have also reported improvements in selected physical complaints associated with PMS [24,25]. Beyond yoga, other mind-body modalities such as Pilates and structured stretching routines have gained clinical attention. Evidence suggests that Pilates exercise performed regularly over 8 to 12 weeks can significantly alleviate premenstrual anxiety, sleep disturbances, and physical discomfort by enhancing core stability, pelvic blood flow, and psychological mindfulness [20, 26]. In a study comparing yoga with aerobic exercise, both interventions reduced pain and PMS symptoms. However, greater improvements in overall symptom severity were observed in the yoga group [27].

### **3.3 Exercise intensity, training load and menstrual health**

Available systematic reviews indicate that regular physical activity may contribute to alleviating PMS symptoms. Beneficial effects have been observed particularly in aerobic exercise programmes and other forms of regular physical activity [20,21]. However, very high training loads, when not adequately balanced by sufficient energy intake, may lead to LEA, which acts as the primary aetiological factor underlying RED-S. The development of RED-S is associated with disturbances in reproductive function, compromised bone health, metabolic alterations, impaired immune function, and deterioration in overall health, well-being, and athletic performance [7,8,9].

The effects of intensive physical activity on psychological well-being are not unequivocal and appear to depend on the magnitude of training load. Research findings indicate that physical activity is generally associated with better mental health. However, these benefits do not increase proportionally with greater exercise duration and frequency. The most favourable outcomes have been observed with moderate exercise volumes, whereas very frequent or prolonged training sessions do not appear to confer additional benefits and may be associated with increased psychological burden [29].

High training loads, particularly when accompanied by LEA, may disrupt the function of the HPO axis. These alterations may result in impaired secretion of gonadotropins and sex hormones, leading to menstrual cycle disturbances, ovulatory dysfunction, oligomenorrhoea, and functional hypothalamic amenorrhoea (FHA) [30,31]. The concept of the Female Athlete Triad is also highly relevant, as it describes the interrelationship between energy availability, reproductive function, and bone health [32,33,34].

In physically active women, the interpretation of menstrual cycle-related symptoms should take into account both premenstrual disorders and other abnormalities of menstrual function, as these conditions occur relatively frequently among female athletes [31,35]. This necessity is further underscored by recent meta-analytical data demonstrating that highly trained and elite female athletes exhibit a substantial pooled prevalence of both PMS and PMDD [35]. The cyclical manifestation of these disorders presents a unique

challenge in sports medicine, as the peak severity of affective and somatic symptoms directly correlates with impaired perceived recovery, increased psychological strain, and compromised training efficiency during the late luteal phase [31,35]. Therefore, in women engaged in intensive training, regular monitoring is recommended not only for PMS symptoms but also for menstrual function, cycle regularity, changes in body weight, and potential indicators of energy deficiency [30,32,34]. Particular attention should be paid to menstrual dysfunction, including prolonged menstrual cycles, oligomenorrhoea, anovulation, and secondary amenorrhoea, which may represent early manifestations of chronic low energy availability [30,32]. Additional warning signs include impaired bone health and the occurrence of bone stress injuries, the risk of which is increased in the presence of an energy deficit [30,34]. Furthermore, clinicians should assess dietary behaviours that may contribute to this state of nutritional depletion, including dietary restriction, disordered eating patterns, and other practices resulting in inadequate energy intake [30].

### **3.4 Practical Recommendations for Exercise Prescription in Women with PMS**

To optimize the therapeutic benefits of physical activity while minimizing reproductive and metabolic risks, exercise prescriptions for women with premenstrual syndrome must be individualized, dynamic, and closely aligned with the physiological demands of the menstrual cycle [1]. For women experiencing mild-to-moderate PMS, structured aerobic training serves as a primary non-pharmacological modality [5,6]. Incorporating 30 to 50 minutes of moderate-intensity aerobic activity (such as swimming or brisk walking) 3 times per week has been consistently shown to alleviate somatic pain, fluid retention, and physical discomfort [21,23]. Additionally, mind-body exercises, specifically yoga, should be integrated to address affective and behavioural manifestations [20]. Clinical evidence indicates that regular yoga practice targets central nervous system pathways, reducing psychological stress, emotional tension, and irritability more effectively than standalone endurance training [24,25]. Conversely, in highly trained and elite female athletes, training program design requires careful adaptation to prevent performance decrements and systemic health risks associated with the symptomatic late luteal phase [31,35]. Periodizing training load by shifting maximal strength training and high-intensity interval training (HIIT) to the follicular phase, when estrogen promotes muscle remodeling and metabolic efficiency, and tapering volume during the symptomatic premenstrual window can improve overall adaptation and adherence [33,34]. Crucially, any adjustment in physical activity volume must prioritize metabolic and energy balance. Maintaining an optimal energy availability (EA) threshold above 45 kcal/kg of fat-free mass per day (FFM/day) is fundamental to protecting the integrity of the HPO axis [7,8]. Clinicians and coaches must actively screen for signs of subclinical or clinical LEA (defined as <30 kcal/kg FFM/day), as chronic energy deficiency acts as the primary etiological trigger for RED-S and secondary menstrual dysfunction [8,30]. Therapeutic physical activity should always be executed under conditions of adequate nutritional intake to prevent severe reproductive, musculoskeletal, and psychological health impairments [30,34].

## **4. Discussion**

Available evidence suggests that physical activity may represent a useful component of non-pharmacological management for women with PMS. The most consistently reported benefits include reductions in the severity of selected physical and psychological symptoms, such as pain, fatigue, emotional tension, low mood, and irritability [5,6]. However, it should be emphasised that the quality of the available evidence is heterogeneous, and individual studies differ substantially with regard to the type of intervention, programme duration, exercise frequency, and methods used to assess symptoms [5].

The therapeutic efficacy of aerobic activities, such as running, walking, and swimming highlighted in the literature [20,21,23], can be attributed to distinct neuroendocrine and vascular mechanisms. Regular cardiorespiratory exercise stimulates the continuous release of endogenous opioid peptides, particularly beta-endorphins, which directly raise the pain threshold and counteract the cyclical mood dips driven by progesterone withdrawal in the late luteal phase [17]. Furthermore, the specific physical improvements observed in swimming trials [23] may be enhanced by the hydroacoustic and hydrostatic properties of water. Aquatic immersion improves peripheral venous return, stimulates skin thermoreceptors, and modulates sympathetic nervous system tone, which physically accelerates the resolution of pelvic congestion and fluid retention [17, 23]. However, from an analytical perspective, the clinical translation of these findings remains complex. While shorter protocols (e.g., 8 weeks) demonstrate swift improvements in somatic complaints like

bloating [23], longer intervention windows (e.g., 3 months) appear necessary to induce stable neurochemical adaptations capable of mitigating severe emotional tension and depressive states [21].

Mind–body interventions, particularly yoga, also occupy an important place in the literature. Systematic reviews and meta-analyses indicate that yoga may reduce the overall severity of PMS symptoms, especially emotional and behavioural manifestations [24,25].

Compared with aerobic exercise, resistance training has been investigated considerably less extensively in the context of PMS. Current evidence is insufficient to support definitive recommendations regarding its use, although it may represent a valuable complement to overall physical activity programmes [6].

An important aspect of this topic is the intensity and volume of physical activity. Moderate, regular exercise appears to be the most appropriate form of activity in the context of PMS. In contrast, very high training loads, particularly when accompanied by inadequate energy intake, may increase the risk of low energy availability (LEA) and Relative Energy Deficiency in Sport (RED-S). RED-S may adversely affect multiple physiological systems, including reproductive function, bone health, metabolism, immune function, psychological well-being, and physical performance [7,8,9].

In women engaged in intensive training, symptom interpretation requires particular caution. Fatigue, low mood, sleep disturbances, and impaired exercise tolerance may be manifestations of PMS; however, they may also reflect excessive training load, inadequate recovery, or low energy availability.

High training loads in combination with LEA may disrupt the function of the hypothalamic–pituitary–ovarian axis and contribute to menstrual disturbances [30,31]. Therefore, in women who train intensively, it is advisable to monitor menstrual cycle regularity, dietary habits, body weight changes, fatigue, and symptoms that may indicate energy deficiency [30,32,34].

A significant limitation of the current body of literature is the substantial heterogeneity across clinical trials. Many studies evaluating the impact of exercise on PMS utilize disparate diagnostic criteria, often relying on retrospective questionnaires rather than the gold-standard prospective daily charting over two consecutive cycles recommended by current guidelines [1, 11]. Furthermore, variations in exercise parameters, including the lack of standardization in training volume, frequency, and objective measures of intensity, limit the ability to perform rigorous quantitative meta-analyses. Additionally, the specific nutritional status and baseline energy availability of the participants are rarely accounted for in general exercise trials, which could confound the reported outcomes on menstrual health and symptom severity.

In summary, physical activity may support the alleviation of PMS symptoms, particularly when it is performed regularly, at a moderate intensity, and tailored to an individual's capabilities. The strongest evidence currently exists for aerobic exercise and yoga. Nevertheless, the available evidence remains insufficient to establish definitive recommendations regarding the optimal type, intensity, frequency, and duration of exercise. In women engaged in intensive training, particular attention should also be paid to the potential risk of low energy availability, RED-S, and menstrual dysfunction [30,35].

## 5. Conclusions

Available scientific evidence demonstrates that structured physical activity constitutes a viable non-pharmacological strategy for the management of PMS. To be effective, however, it must be performed regularly, maintained at a moderate intensity, and tailored to individual tolerance. The most robust clinical support exists for aerobic exercise and yoga, which effectively mitigate key somatic and psychological manifestations, such as abdominal discomfort, fatigue, emotional tension, and cyclical mood disturbances. Conversely, data regarding the therapeutic utility of resistance training remain sparse, and the systemic outcomes of such interventions are heavily contingent upon training volume, structural recovery, and metabolic balance. Excessive training loads, particularly when compounded by inadequate nutritional intake, significantly elevate the risk of inducing LEA, RED-S, and secondary menstrual disorders. Consequently, exercise prescriptions for this population must be highly individualized, carefully integrating symptom severity, baseline training status, and endocrine safety thresholds. This highlights the fundamental need for rigorous, high-quality prospective clinical trials to establish standardized guidelines regarding the optimal modality, dosing, and timing of exercise interventions in PMS management.

**Author contributions:****Conceptualization:** Justyna Bury, Aleksandra Papuga, Makary Hejduk, Magdalena Grzymek**Formal analysis:** Justyna Bury, Katarzyna Pawluczka, Aleksandra Pawluczka, Weronika Kępa, Joanna Kadłuczka, Martyna Więclawek**Investigation:** Justyna Bury, Magdalena Grzymek, Aneta Sobek, Aleksandra Pawluczka, Jan Potoniec, Katarzyna Kraska, Weronika Kępa**Writing rough preparation:** Justyna Bury, Aleksandra Papuga, Makary Hejduk, Magdalena Grzymek, Aleksandra Pawluczka, Katarzyna Pawluczka, Katarzyna Kraska, Joanna Kadłuczka, Jan Potoniec, Weronika Kępa, Aneta Sobek, Martyna Więclawek**Writing review and editing:** Justyna Bury, Aleksandra Papuga, Makary Hejduk, Joanna Kadłuczka, Martyna Więclawek, Katarzyna Pawluczka, Katarzyna Kraska, Aneta Sobek, Jan Potoniec**Supervision:** Justyna Bury

All authors have read and agreed with the published version of manuscript.

**Funding:** This research received no external funding.**Data Availability Statement:** The authors confirm that the data supporting the findings of this study are available within the article's bibliography.**Declaration of AI Use:** Artificial intelligence (AI) was used only for language enhancement purposes, such as grammar correction and stylistic refinement.**REFERENCES**

1. American College of Obstetricians and Gynecologists. (2023). Management of premenstrual disorders: ACOG Clinical Practice Guideline No. 7. *Obstetrics & Gynecology*, 142(6), 1516–1533. <https://doi.org/10.1097/AOG.0000000000005426>
2. Liguori, F., Saraiello, E., & Calella, P. (2023). Premenstrual syndrome and premenstrual dysphoric disorder's impact on quality of life, and the role of physical activity. *Medicina*, 59(11), Article 2044. <https://doi.org/10.3390/medicina59112044>
3. Schoep, M. E., Adang, E. M. M., Maas, J. W. M., de Bie, B., Aarts, J. W. M., & Nieboer, T. E. (2019). Productivity loss due to menstruation-related symptoms: A nationwide cross-sectional survey among 32 748 women. *BMJ Open*, 9(6), Article e026186. <https://doi.org/10.1136/bmjopen-2018-026186>
4. Wang, Q., Keijser, R., Chen, Y., et al. (2025). Premenstrual disorders and quality of life in Sweden. *JAMA Network Open*, 8(9), Article e2533823. <https://doi.org/10.1001/jamanetworkopen.2025.33823>
5. Cary, E., & Simpson, P. (2024). Premenstrual disorders and PMDD - a review. *Best Practice & Research Clinical Endocrinology & Metabolism*, 38(1), Article 101858. <https://doi.org/10.1016/j.beem.2023.101858>
6. Pearce, E., Jolly, K., Jones, L. L., Matthewman, G., Zanganeh, M., & Daley, A. (2020). Exercise for premenstrual syndrome: A systematic review and meta-analysis of randomised controlled trials. *BJGP Open*, 4(3), Article bjgpopen20X101032. <https://doi.org/10.3399/bjgpopen20X101032>
7. Angelidi, A. M., Stefanakis, K., Chou, S. H., et al. (2024). Relative Energy Deficiency in Sport (REDs): Endocrine manifestations, pathophysiology and treatments. *Endocrine Reviews*, 45(5), 676–708. <https://doi.org/10.1210/endrev/bnae011>
8. Mountjoy, M., Ackerman, K. E., Bailey, D. M., et al. (2023). 2023 International Olympic Committee's (IOC) consensus statement on Relative Energy Deficiency in Sport (REDs). *British Journal of Sports Medicine*, 57(17), 1073–1097. <https://doi.org/10.1136/bjsports-2023-106994>
9. Cabre, H. E., Moore, S. R., Smith-Ryan, A. E., & Ryan, E. D. (2022). Relative Energy Deficiency in Sport (RED-S): Scientific, clinical, and practical implications for the female athlete. *Nutrients*, 14(13), Article 2657. <https://doi.org/10.3390/nu14132657>
10. Ayyub, S., Agrawal, M., Sharma, V., & Aravind, A. (2024). The effect of physical activity on premenstrual syndrome: A systematic review. *Annals of Neurosciences*, 32(4), 315–320. <https://doi.org/10.1177/09727531241297012>

11. Yoshimi, K., Inoue, F., Odai, T., et al. (2024). Practical diagnosis and treatment of premenstrual syndrome and premenstrual dysphoric disorder by psychiatrists and obstetricians/gynecologists in Japan. *PCN Reports*, 3(3), Article e234. <https://doi.org/10.1002/pcn5.234>
12. Gudipally, P. R., & Sharma, G. K. (2023). Premenstrual syndrome. In StatPearls. StatPearls Publishing.
13. Naik, S. S., Nidhi, Y., Kumar, K., & Grover, S. (2023). Diagnostic validity of premenstrual dysphoric disorder: Revisited. *Frontiers in Global Women's Health*, 4fx, Article 1181583. <https://doi.org/10.3389/fgwh.2023.1181583>
14. Hantsoo, L., & Payne, J.L. (2023). Towards understanding the biology of premenstrual dysphoric disorder: From genes to GABA. *Neuroscience & Biobehavioral Reviews*, 149, Article 105168. <https://doi.org/10.1016/j.neubiorev.2023.105168>
15. Hantsoo, L., & Epperson, C. N. (2020). Allopregnanolone in premenstrual dysphoric disorder (PMDD): Evidence for dysregulated sensitivity to GABA-A receptor modulating neuroactive steroids across the menstrual cycle. *Neurobiology of Stress*, 12, Article 100213. <https://doi.org/10.1016/j.ynstr.2020.100213>
16. Firth, J., Solmi, M., Wootton, R. E., et al. (2020). A meta-review of "lifestyle psychiatry": The role of exercise, smoking, diet and sleep in the prevention and treatment of mental disorders. *World Psychiatry*, 19(3), 360–380. <https://doi.org/10.1002/wps.20773>
17. Smith, P. J., & Merwin, R. M. (2021). The role of exercise in management of mental health disorders: An integrative review. *Annual Review of Medicine*, 72, 45–62. <https://doi.org/10.1146/annurev-med-060619-022943>
18. Xie, Y., Liu, S., Chen, X. J., Yu, H.H., Yang, Y., & Wang, W. (2021). Effects of exercise on sleep quality and insomnia in adults: A systematic review and meta-analysis of randomized controlled trials. *Frontiers in Psychiatry*, 12, Article 664499. <https://doi.org/10.3389/fpsy.2021.664499>
19. Scheffer, D. D. L., & Latini, A. (2020). Exercise-induced immune system response: Anti-inflammatory status on peripheral and central organs. *Biochimica et Biophysica Acta (BBA) - Molecular Basis of Disease*, 1866(10), Article 165823. <https://doi.org/10.1016/j.bbadis.2020.165823>
20. Yesildere Saglam, H., & Orsal, O. (2020). Effect of exercise on premenstrual symptoms: A systematic review. *Complementary Therapies in Medicine*, 48, Article 102272. <https://doi.org/10.1016/j.ctim.2019.102272>
21. Ravichandran, H., & Janakiraman, B. (2022). Effect of aerobic exercises in improving premenstrual symptoms among healthy women: A systematic review of randomized controlled trials. *International Journal of Women's Health*, 14, 1105–1114. <https://doi.org/10.2147/IJWH.S371193>
22. Mohebbi Dehnavi, Z., Jafarnejad, F., & Sadeghi Goghary, S. (2018). The effect of 8 weeks aerobic exercise on severity of physical symptoms of premenstrual syndrome: A clinical trial study. *BMC Women's Health*, 18(1), Article 80. <https://doi.org/10.1186/s12905-018-0565-5>
23. Maged, A. M., Abbassy, A. H., Sakr, H. R. S., et al. (2018). Effect of swimming exercise on premenstrual syndrome. *Archives of Gynecology and Obstetrics*, 297(4), 951–959. <https://doi.org/10.1007/s00404-018-4664-1>
24. Pal, A., Nath, B., Paul, S., & Meena, S. (2022). Evaluation of the effectiveness of yoga in management of premenstrual syndrome: A systematic review and meta-analysis. *Journal of Psychosomatic Obstetrics & Gynecology*, 43(4), 517–525. <https://doi.org/10.1080/0167482X.2022.2086457>
25. Ranga, M., & Dev, K. (2024). The effect of yoga therapy in premenstrual syndrome: A systematic review and meta-analysis of randomised controlled trials. *Journal of Obstetrics and Gynaecology Canada*, 46(10), Article 102579. <https://doi.org/10.1016/j.jogc.2024.102579>
26. Çitil, E. T., & Kaya, N. (2021). Effect of pilates exercises on premenstrual syndrome symptoms: A quasi-experimental study. *Complementary Therapies in Medicine*, 57fx, Article 102623. <https://doi.org/10.1016/j.ctim.2020.102623>
27. Vaghela, N., Mishra, D., Sheth, M., & Dani, V. B. (2019). To compare the effects of aerobic exercise and yoga on Premenstrual syndrome. *Journal of Education and Health Promotion*, 8, Article 199. [https://doi.org/10.4103/jehp.jehp\\_50\\_19](https://doi.org/10.4103/jehp.jehp_50_19)
28. McNulty, K. L., Elliott-Sale, K. J., Dolan, E., Swinton, P. A., Ansdell, P., Goodall, S., Thomas, K., & Hicks, K. M. (2020). The effects of menstrual cycle phase on exercise performance in eumenorrheic women: A systematic review and meta-analysis. *Sports Medicine*, 50(10), 1813–1827. <https://doi.org/10.1007/s40279-020-01319-3>
29. Chekroud, S. R., Gueorguieva, R., Zheutlin, B. E., et al. (2018). Association between physical exercise and mental health in 1·2 million individuals in the USA between 2011 and 2015: A cross-sectional study. *The Lancet Psychiatry*, 5(9), 739–746. [https://doi.org/10.1016/S2215-0366\(18\)30227-X](https://doi.org/10.1016/S2215-0366(18)30227-X)

30. Gallant, T. L., Ong, L. F., Wong, L., et al. (2025). Low energy availability and relative energy deficiency in sport: A systematic review and meta-analysis. *Sports Medicine*, 55(2), 325–339. <https://doi.org/10.1007/s40279-024-02130-0>
31. Taim, B. C., Ó Catháin, C., Renard, M., Elliott-Sale, K. J., Madigan, S., & Ni Chéilleachair, N. (2023). The prevalence of menstrual cycle disorders and menstrual cycle-related symptoms in female athletes: A systematic literature review. *Sports Medicine*, 53(10), 1963–1984. <https://doi.org/10.1007/s40279-023-01871-8>
32. Ihalainen, J. K., Mikkonen, R. S., Ackerman, K. E., et al. (2024). Beyond menstrual dysfunction: Does altered endocrine function caused by problematic low energy availability impair health and sports performance in female athletes?. *Sports Medicine*, 54(9), 2267–2289. <https://doi.org/10.1007/s40279-024-02065-6>
33. De Souza, M. J., Williams, N. I., Misra, M., et al. (2026). 2025 Update to the Female Athlete Triad Coalition Consensus Statement Part 1: State of the science and introduction of a new adolescent model. *Sports Medicine*, 56(2), 327–373. <https://doi.org/10.1007/s40279-025-02333-z>
34. Williams, N. I., De Souza, M. J., Misra, M., et al. (2026). 2025 Update to the Female Athlete Triad Coalition Consensus Statement Part 2: Clinical guidelines for screening, diagnosis, treatment, and return to play for adolescents and adults. *Sports Medicine*, 56(2), 375–427. <https://doi.org/10.1007/s40279-025-02332-0>
35. Granda, D., Szmidt, M. K., Surała, O., & Malczewska-Lenczowska, J. (2025). Prevalence of premenstrual syndrome and premenstrual dysphoric disorder among highly trained and elite female athletes: A systematic review and meta-analysis. *Biology of Sport*, 42(3), 211–225. <https://doi.org/10.5114/biolsport.2025.148542>