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Therapeutic Role of Dorsal Stretching Exercise Interventions on Premenstrual Syndrome Symptoms in Adolescent Females

Mary Minolin. T[1*], *Hema.* M[1], *Mary* Nithya. P[2], *Tamilselvi.* S[1] and *Thenmozhi.* P[1]

[1]Saveetha College of Nursing, Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai, India
[2]Smt. Rukmaniben Deepchandbhai Gardi Nurses Training Centre, Indore, India

Abstract. Background: Premenstrual Syndrome (PMS) poses a considerable challenge to the physical, emotional, and behavioural health of adolescent girls. This research was undertaken to assess the efficacy of dorsal stretching exercises in alleviating PMS-related symptoms. Methods: A six-week quantitative experimental study was conducted in Mappedu, Tiruvallur, involving 60 adolescent girls aged between 11 and 21 years, selected using purposive sampling. Participants were evenly allocated into experimental and control cohorts. Data were gathered using a structured demographic survey and the Premenstrual Syndrome Severity Questionnaire. The experimental group engaged in dorsal stretching exercises twice daily for a duration of two weeks, whereas the control group received only health education. Results: Before the intervention, most participants in both groups reported moderate to severe PMS symptoms. Post-intervention analysis revealed that 63.3% of the experimental group experienced only mild symptoms, in contrast to just 6.6% in the control group. A statistically significant reduction in mean PMS severity scores was noted in the experimental group (from 35.2 to 23.5; $t = 13.96$, $P < 0.001$), while the control group showed no meaningful change ($t = 1.06$, $P > 0.05$). Additionally, dietary habits were found to be significantly correlated with PMS severity ($p = 0.001$). Conclusion: Dorsal stretching exercises proved to be highly effective in mitigating the intensity of premenstrual symptoms among adolescent girls. The integration of such simple, non-pharmacological interventions may offer a practical and accessible approach for managing PMS symptoms within this demographic.

1 Introduction

Premenstrual Syndrome (PMS) is a multifaceted disorder characterised by a constellation of recurring physical, psychological, and behavioural symptoms that manifest during the luteal phase of the menstrual cycle. These symptoms often subside with the onset of menstruation. Affecting a substantial proportion of menstruating individuals, PMS exerts a profound impact on quality of life, particularly among adolescent girls who are still navigating physical and emotional developmental milestones. This transitional phase of adolescence—marked by hormonal surges, academic pressures, and psychosocial changes—renders young females more vulnerable to the disruptive effects of PMS, often leading to diminished academic performance, reduced social interaction, emotional instability, and poor physical health. The pathophysiology of PMS remains complex, involving fluctuations in sex hormones—primarily estrogen and progesterone—alongside imbalances in neurotransmitters such as serotonin and gamma-aminobutyric acid (GABA). These biochemical changes contribute to the broad spectrum of PMS symptoms, which include but are not limited to abdominal cramps, fatigue, mood swings, irritability, breast tenderness, anxiety, and depressive episodes. Given the pervasive nature of PMS and its detrimental effects, there is an urgent need for effective and sustainable intervention strategies, particularly those that are non-pharmacological and accessible to adolescent populations. In recent years, there has been a growing body of evidence supporting the role of physical activity—particularly stretching and mind-body exercises—as a viable therapeutic approach for mitigating PMS symptoms [14]. Studies have demonstrated that physical activity can modulate the neuroendocrine system, promote endorphin release, improve circulation, and reduce cortisol levels, thereby alleviating both somatic and psychological distress. Notably, dorsal stretching exercises have garnered attention for their simplicity, feasibility, and capacity to target musculoskeletal tension often associated with premenstrual discomfort.

Karim et al. (2023) [2] emphasised the therapeutic potential of structured physical routines, including stretching, in reducing the intensity of PMS-related somatic symptoms such as abdominal pain, headaches, and muscular tension. Their comparative study revealed that dynamic physical movements provided greater symptomatic relief than passive relaxation techniques alone, highlighting the importance of movement-based interventions. Similarly, Tsai (2016) [6] explored the effectiveness of yoga—a discipline inherently rich in

* Corresponding author: minolinbabu@gmail.com

stretching elements—and found significant improvements not only in PMS symptomatology but also in broader health parameters, including physical vitality, emotional stability, and cognitive function. These findings collectively underscore the physiological and psychological benefits of integrating stretching into routine adolescent care. Furthermore, aerobic and stretching exercises have been implicated in the regulation of hormonal activity, which is central to PMS pathogenesis. Mohebbi-Dehnavi et al. (2018) [4] observed a marked reduction in serum levels of progesterone and prolactin following a sustained aerobic exercise program. These hormonal shifts have been associated with decreased fatigue, stabilised mood, and attenuated irritability—core symptoms of PMS. While aerobic exercise served as the primary intervention in their study, the inclusion of structured stretching could feasibly amplify these effects by enhancing neuromuscular relaxation and improving lymphatic drainage. Complementary biochemical evidence from Elbably et al. (2023) [1] further substantiates the role of regular physical activity in modulating blood lipid profiles and reducing oxidative stress, which in turn contribute to the attenuation of premenstrual discomfort.

Psychological well-being is another critical dimension of PMS that can be positively influenced through physical intervention. The mental health burden of PMS—manifesting in symptoms such as anxiety, depression, and emotional lability—can severely disrupt daily functioning in adolescents. Omara et al. (2024) [5] established that even moderate-intensity stretching routines can elevate mood, likely through the activation of the endorphin pathway and improved parasympathetic nervous system response. In tandem, Kroll-Desrosiers et al. (2017) [3] demonstrated that recreational physical activity, incorporating both aerobic and flexibility-based movements, significantly diminished the severity of PMS in young females. Their work emphasises the practicality and cost-effectiveness of such interventions as alternatives to pharmaceutical therapies, which may not be desirable or feasible for all adolescent populations. Taken together, these findings lend strong support to the integration of dorsal stretching exercises into adolescent health protocols as a proactive and empowering strategy for PMS management [13]. Unlike pharmacological approaches that often carry side effects or long-term concerns, stretching exercises offer a safe, non-invasive, and holistic modality that addresses both physical discomfort and emotional dysregulation. By fostering bodily awareness, improving circulation, and enhancing hormonal equilibrium, such practices align well with the biopsychosocial model of health—particularly in the context of adolescent development.

In conclusion, the implementation of dorsal stretching exercises among adolescent girls experiencing Premenstrual Syndrome holds significant promise as an effective and sustainable method for symptom mitigation. Future investigations should consider longitudinal research designs to evaluate the sustained benefits of such interventions and identify the optimal frequency, duration, and types of stretches most conducive to symptom relief. In the interim, promoting such non-pharmacological strategies may bridge critical gaps in adolescent reproductive health care, fostering resilience, autonomy, and holistic well-being among young women.

2 Literature Review

Premenstrual Syndrome (PMS) is recognised as a recurrent and distressing condition that disrupts the physical, emotional, and cognitive functioning of many adolescent girls [7]. While the aetiology of PMS remains multifactorial—encompassing hormonal fluctuations, neurotransmitter imbalances, and lifestyle factors—researchers have increasingly emphasised the value of physical interventions as viable alternatives to pharmaceutical treatments. Within this scope, stretching-based regimens have gained prominence due to their accessibility, minimal side effects, and holistic benefits [8]. Numerous studies highlight the physiological advantages of integrating physical movement into PMS management. Stretching, in particular, is associated with the reduction of muscle tension, improved circulation, and enhanced parasympathetic activity, which collectively mitigate pain and discomfort. An investigation demonstrated that consistent engagement in structured stretching routines significantly decreased the incidence of musculoskeletal symptoms among menstruating adolescents [4]. The study emphasised how targeting the posterior muscle chain—such as in dorsal stretches—can alleviate lower back pain and pelvic tension, symptoms commonly reported during the luteal phase.

Findings explored the impact of flexibility-based training on hormonal regulation, indicating that regular stretching exercises influenced estrogen-progesterone ratios and contributed to menstrual cycle stability. These hormonal adjustments were associated with reduced emotional reactivity and fatigue levels [9]. Additionally, reported that flexibility-focused interventions contributed to improved sleep quality and energy levels in adolescent females, both of which are frequently compromised by PMS. Beyond the physiological dimension, the psychological effects of stretching exercises are also well-documented [10]. Research found a marked improvement in emotional well-being and mood stability among adolescent participants following a three-week stretching program. The release of endogenous opioids such as endorphins during physical activity was noted as a key factor in promoting relaxation and reducing irritability. In parallel, a cross-sectional analysis suggested that adolescents who practised stretching regularly exhibited greater resilience to stressors associated with hormonal changes during their menstrual cycle [11].

While a wide range of physical activities can produce benefits, stretching exercises offer a particularly low-barrier, adaptable option suitable for diverse populations, including those without prior training or access to fitness resources, by Machine Learning or IoT-based advanced studies [12], [15]. These routines are especially relevant for school-based interventions and public health programs aiming to support adolescent girls through natural, cost-effective methods [3]. In summary, the literature strongly supports the integration of stretching exercises—specifically dorsal stretches—into daily routines as a promising strategy to manage PMS symptoms among adolescents. The physiological, hormonal, and psychological improvements observed across various studies advocate for a broader implementation of such interventions [4]. Continued research should focus on identifying the optimal duration, intensity, and frequency of stretching protocols to maximise outcomes in this vulnerable population.

3 Methodology

3.1 Study Design and Participants

This study employed a quantitative, quasi-experimental research design aimed at evaluating the therapeutic efficacy of dorsal stretching exercises in mitigating premenstrual symptoms among adolescent girls. The investigation was conducted over a continuous six-week period in the rural locality of Mappedu, situated in the Tiruvallur District of Tamil Nadu, India. The research specifically targeted adolescent females aged between 11 and 21 years, a demographic recognised for both the prevalence of PMS and the physiological and psychological transitions associated with puberty. Eligible participants were those who experienced regular menstrual cycles and reported recurring physical, emotional, and behavioural disturbances aligned with clinically recognised premenstrual symptomatology.

3.2 Sampling and Sample Size

A purposive sampling technique was utilised to selectively recruit participants who met predefined eligibility criteria. A total of 60 adolescent girls were enrolled in the study and were equitably distributed into two groups: the experimental group (n = 30), which received the intervention, and the control group (n = 30), which did not receive the intervention during the study period. This sampling approach ensured the inclusion of individuals with relevant symptom profiles while maintaining homogeneity across both cohorts for comparative purposes.

3.3 Inclusion and Exclusion Criteria

The inclusion criteria mandated that participants:

- Be within the 11–21 years age range,
- Experience regular menstrual cycles,
- Exhibit premenstrual physical symptoms, such as bloating, abdominal cramps, breast tenderness, fatigue, fluid retention, and headaches,
- Report emotional manifestations, including irritability, anxiety, mood instability, and mild depressive episodes.
- Demonstrate behavioural changes, such as disrupted sleep patterns, altered appetite, and reduced social interaction during the premenstrual phase.

Participants were excluded from the study if they had been medically diagnosed with any of the following:

- Endocrine disorders (e.g., hypothyroidism),
- Irregular menstrual cycles,
- Psychiatric conditions such as clinical depression or phobic disorders,
- Gynaecological abnormalities like polycystic ovarian syndrome (PCOS) or androgen excess disorders,
- Chronic medical illnesses, including leukaemia,
- Or if they had experienced recent fractures, injuries, or surgical interventions that might limit their ability to perform physical exercises.

3.4 Data Collection Instruments

To facilitate comprehensive data gathering, two instruments were employed:

1. A structured demographic questionnaire, designed to collect baseline variables such as age, menstrual history, health status, and lifestyle behaviours.
2. The Premenstrual Syndrome Severity Questionnaire (PMSSQ), a validated tool used to assess both the presence and severity of premenstrual symptoms across the physical, emotional, and behavioural domains before and after the intervention phase.

3.5 Ethical Considerations and Preliminary Approvals

Prior to initiating the study, formal permission was obtained from the local Village Panchayat leader, serving as the community gatekeeper. Informed consent was also secured from both the adolescent participants and their legal guardians, ensuring ethical compliance and voluntary participation in accordance with research ethics protocols.

3.6 Intervention and Data Collection Procedure

On the first day (Day 1), all participants completed the demographic questionnaire, followed by an initial PMS symptom assessment using the PMSSQ. Participants in the experimental group then received a detailed demonstration of dorsal stretching exercises, guided by a trained facilitator. These exercises were designed to target the musculature of the back and pelvis, areas commonly associated with PMS-related discomfort. Participants were instructed to perform the exercises for 20–30 minutes, twice daily (morning and evening), consistently for two consecutive weeks.

Throughout the intervention phase, routine follow-up visits were conducted by the researcher to monitor compliance, address any concerns, and reinforce adherence to the exercise protocol. In addition, the experimental group received structured health education, including illustrated exercise instructions, safety precautions, and wellness guidance relevant to menstrual health.

At the end of the two-week intervention, participants from both groups were re-evaluated using the PMSSQ to assess changes in symptom severity. The control group, while not engaged in the stretching protocol during the study period, was provided with the same health education regarding dorsal stretching exercises after the conclusion of their menstrual cycle to maintain ethical equity.

3.7 Statistical Analysis

All collected data were entered into a statistical software platform and analysed using appropriate inferential and descriptive statistical techniques. The efficacy of the intervention was measured by comparing pre- and post-test scores within and between the experimental and control groups. Key statistical metrics included mean difference analysis, paired and independent t-tests, and significance levels (P-values) to determine the effectiveness of the dorsal stretching intervention in alleviating PMS symptoms.

Fig. 1. Proposed methodology for the proposed architecture.

Figure 1 shows the framework for the proposed architecture.

4 Results and Discussions

Table 1 shows the demographic variables of PMS in the experimental and control groups. The study population consisted of 60 adolescent girls, who were evenly assigned to two cohorts—an experimental group and a control group, each comprising 30 participants. The predominant age range among the participants was 15 to 19 years, indicating a concentration in mid to late adolescence. The onset of menarche for most participants was reported between 10 and 14 years, reflecting a typical age of pubertal initiation. In terms of sociocultural background, a majority identified as Hindu, and their educational attainment spanned from primary school level to undergraduate studies, suggesting a heterogeneous academic profile. From a health perspective, most of the girls exhibited a Body Mass Index (BMI) within the normal to slightly elevated range, signifying an overall trend toward acceptable nutritional status. Additionally, dietary patterns were largely reported as balanced and consistent with general health recommendations. Menstrual regularity was common, with a significant proportion experiencing regular cycles, which facilitated consistent symptom tracking throughout the study. Only a minor subset of participants disclosed a family history of premenstrual syndrome, suggesting that hereditary predisposition played a limited role in this sample group.

Table 1. Demographic variables of PMS in the experimental and control group (N=60).

Demographic variables	Experimental group		Control group	
	Frequency	%	Frequency	%
1. Age in years				
a) 11-15 years	7	23.4	5	16.7
b) 15-19 years	13	43.3	14	46.6
c) 20-21 years	10	33.3	11	36.7
2. Age at menarche				
a) 10-14 years	18	60	16	53.4
b) 14-17 years	12	40	14	46.6
3. Religion				
a) Hindu	19	63.3	16	53.4
	7	23.4	8	26.6

b) Chirstian c) Muslim	4	13.3	6	20
4. Educational status a) Not educated b) Primary education c) Secondary education d) undergraduate	7 8 8 7	23.4 26.6 26.6 23.4	6 7 9 8	20 23.4 30 26.6
5. Body mass index a) <18.5 b) 18.5-24.9 c) 25.0-29.9 d) >30.0	6 7 8 9	20 23.4 26.6 30	6 6 10 8	20 20 33.3 26.6
6. Food habits a) Normal b) Spicy c) Fast food	18 10 2	60 33.4 6.6	17 9 4	56.7 30 13.3
7. Menstrual cycle a) Regular b) Irregular	20 10	66.6 33.4	21 9	70 30
8. Family history of Premenstrual syndrome a) Yes b) No	7 23	23.4 76.6	9 21	30 70

Table 2 shows that the data presented in the table clearly illustrate that the predominant proportion of participants in both the experimental and control groups reported experiencing moderate levels of premenstrual syndrome (PMS) symptoms during the pre-intervention assessment. Specifically, 56.6% of individuals in the experimental group and 53.4% in the control group fell within the moderate symptom severity category, indicating a substantial overlap in symptom intensity across both cohorts at baseline. In contrast, a notable percentage of participants reported severe manifestations of PMS, with 43.4% in the experimental group and 46.6% in the control group classified under this category. This suggests a comparably high burden of severe symptoms among both groups prior to the intervention. Interestingly, no participants in either group reported experiencing mild symptoms, indicating that all study subjects were affected by moderate to severe symptomatology, further emphasising the relevance and necessity of evaluating non-pharmacological management strategies such as dorsal stretching exercises.

Table 2. Pre-test of pre-menstrual syndrome severity among adolescent girls (N=60).

Premenstrual syndrome severity	Experimental group		Control group	
	F	%	F	%
Mild	0	0	0	0
Moderate	17	56.6	16	53.4
Severe	13	43.4	14	46.6

Figure 2 shows that after the intervention, 63.3% of participants in the experimental group experienced mild premenstrual syndrome symptoms compared to only 6.6% in the control group. Moderate symptoms were reported by 26.7% in the experimental group and 43.4% in the control group. Severe symptoms were notably lower in the experimental group (10%) compared to the control group (50%).

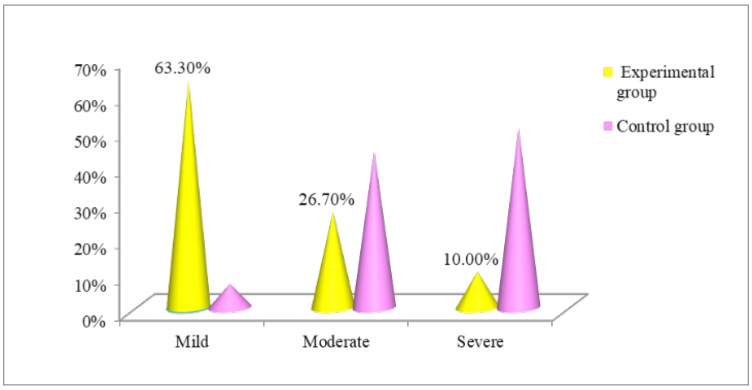

Fig. 2. Post-test level of premenstrual syndrome severity among adolescent girls.

Table 3 shows the effectiveness of dorsal stretching exercise on premenstrual syndrome. In the experimental group, the mean premenstrual syndrome severity score decreased significantly from 35.2 (SD = 11.5) to 23.5 (SD = 10.5) after the intervention, with a highly significant t-value of 13.96 ($P < 0.001$). In contrast, the control group showed no significant change, with mean scores of 38.9 (SD = 10.7) at pre-test and 39.5 (SD = 11.3) at post-test, yielding a t-value of 1.06 (P > 0.05).

Table 3. Effectiveness of dorsal stretching exercise on premenstrual syndrome. (n=60).

Study Group	Pre test		Post test		"t" value
	Mean	SD	Mean	SD	
Experimental group	35.2	11.5	23.5	10.5	*13.96 P<0.001
Control group	38.9	10.7	39.5	11.3	1.06 P<0.06

***p<0.05, S – Significant

Table 4 shows the association of post-test level of PMS in the experimental group with selected demographic variables. Among the demographic variables analysed, food habits showed a statistically significant association with the level of premenstrual syndrome severity ($\chi^2 = 22.9$, p = 0.001). Although the chi-square value for body mass index (BMI) was 8.08 with a p-value of 0.004, it was considered not significant based on the study criteria. All other demographic variables, including age, age at menarche, religion, educational status, socio-economic status, menstrual cycle, and family history of PMS, did not show any significant association with premenstrual syndrome severity.

Table 4. Association of Post Test level of PMS in Experimental Group with selected demographic Variables.

Demographic Variable	Chi-square (χ^2)	p-value	Significance
Age in years	0.31	0.047	Not Significant (NS)
Age at menarche	0.9	0.320	Not Significant (NS)
Religion	2.7	0.096	Not Significant (NS)
Educational status	5.1	0.023	Not Significant (NS)
Socio-economic status	1.4	0.228	Not Significant (NS)
Body Mass Index (BMI)	8.08	0.004	Not Significant (NS)
Food habits	22.9	0.001	Significant (*S)
Menstrual cycle	1.7	0.182	Not Significant (NS)
Family history of Premenstrual Syndrome (PMS)	0.7	0.375	Not Significant (NS)

*p<0.05, S – Significant

The outcomes of the present study demonstrate a marked reduction in the severity of premenstrual syndrome (PMS) symptoms among participants who engaged in a structured dorsal stretching exercise regimen. At baseline, both the experimental and control cohorts exhibited a high prevalence of moderate to severe PMS symptoms, signifying a widespread need for targeted, non-pharmacological interventions. Following the intervention, a substantial shift in symptom severity was observed in the experimental group, wherein 63.3% of participants reported only mild PMS symptoms, in stark contrast to the control group, which exhibited minimal or no symptomatic improvement. This pronounced difference highlights the therapeutic efficacy of dorsal stretching exercises in alleviating the multifactorial manifestations of PMS. Furthermore, statistical analysis revealed a significant reduction in the mean PMS severity score, descending from 35.2 to 23.5, with a t-value of 13.96 and a P-value less than 0.001, thus confirming the high statistical significance of the intervention's impact on symptom management and overall participant well-being. These findings underscore the potential of dorsal stretching exercises as an effective modality to mitigate both the physical and emotional burdens associated with PMS.

Corroborating literature lends additional support to the beneficial role of physical activity in PMS management. Research affirmed that aerobic exercises demonstrate superior outcomes in reducing PMS symptoms compared to other forms of physical movement, attributing this effect to improvements in circulatory efficiency, hormonal regulation, and emotional resilience. While the literature predominantly emphasises aerobic interventions, there remains a paucity of empirical studies that specifically examine the effects of isolated stretching routines, such as dorsal exercises, on PMS. For instance, explored the broader physiological benefits of structured physical activity, noting enhancements in muscle flexibility, postural stability, and strength. However, their findings did not explicitly address the relationship between such interventions and PMS symptomatology. Thus, while the current study's findings resonate with the overarching consensus regarding the value of exercise for menstrual health, there is a clear research gap regarding the isolated role of stretching exercises—particularly dorsal movements—in PMS relief. In conclusion, the results affirm the clinical relevance and utility of dorsal stretching as a cost-effective, non-invasive intervention for adolescent girls experiencing PMS. Nevertheless, future investigations incorporating larger sample sizes and longitudinal study designs are warranted to validate and generalise these findings, and to further elucidate the mechanistic underpinnings through which stretching alleviates premenstrual symptoms.

5 Conclusion

The results of this study indicate that dorsal stretching exercises serve as an effective, non-pharmacological intervention for alleviating the symptoms associated with premenstrual syndrome (PMS) among adolescent girls. Participants who consistently practised these stretching exercises over a two-week period exhibited significant reductions in a range of PMS-related symptoms, including menstrual cramps, mood fluctuations, irritability, anxiety, fatigue, and other physical and emotional disturbances commonly reported during the luteal phase of the menstrual cycle. The observed improvements may be attributed to the physiological and psychological benefits of stretching, which include enhanced muscle relaxation, improved blood circulation, and the activation of endorphins, all of which are known to contribute to pain relief, emotional regulation, and overall stress reduction. These findings underscore the therapeutic potential of simple, structured stretching routines in supporting menstrual health and improving the quality of life for adolescent girls. Furthermore, the statistically significant reduction in PMS severity scores among the experimental group reinforces the validity of the formulated alternative hypothesis, thereby affirming the intervention's effectiveness. Given the growing interest in holistic and lifestyle-based approaches to adolescent health, dorsal stretching exercises offer a cost-effective, accessible, and easily implementable strategy that can be seamlessly integrated into school-based wellness initiatives, physical education curricula, or community health programs. Encouraging adolescents to adopt such healthy physical habits could yield long-term benefits by promoting better menstrual hygiene management, reducing school absenteeism, and enhancing academic performance through improved physical and emotional well-being.

While the findings are promising, the scope of the current study was limited in terms of duration, geographic representation, and sample size. Future research should aim to conduct longitudinal studies to examine the sustained effects of dorsal stretching exercises over multiple menstrual cycles. To explore the optimal frequency, intensity, and duration of the stretching routines for maximum therapeutic benefit. To assess the intervention's efficacy across diverse cultural, socioeconomic, and lifestyle backgrounds to ensure generalizability. Investigate the neuroendocrine mechanisms underpinning the symptom relief observed, potentially integrating hormonal assays and biomarker analyses. Compare the effectiveness of dorsal stretching with other forms of physical activity, such as yoga, aerobic exercises, or mindfulness-based interventions.

In summary, this study provides a strong foundational basis for advocating dorsal stretching exercises as a supportive modality in PMS management among adolescents. With further empirical validation and wider implementation, such interventions hold the potential to significantly enhance menstrual health literacy and empowerment in young female populations.

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