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How Premenstrual Syndrome Affects Body Awareness and Emotional Performance in Collegiate Female Athletes?

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Abstract

Throughout the menstrual cycle, hormonal fluctuations can significantly influence both the physical and psychological processes of female athletes. Premenstrual syndrome (PMS) is a common condition that affects physical and emotional functions and can impact daily activities and athletic performance. The physical and emotional changes associated with PMS may alter female athletes' performance-related emotional states and their perception of their bodies. This cross-sectional and observational study aimed to examine the effects of PMS on body awareness and performance-related emotional states in collegiate female athletes. A total of 412 collegiate female athletes participated in the study. Demographic information was collected using a demographic data form. The presence of PMS was assessed with the Premenstrual Syndrome Scale (PMSS), performance-related emotional states were measured using the Continuous Optimal Performance Emotional State Scale-2 (COPESS-2), and body awareness was evaluated with the Body Awareness Questionnaire (BAQ). The results revealed a statistically significant difference in COPESS-2 total and subscale scores between athletes with and without PMS ($p<0.05$). A negative correlation was found between PMSS scores and COPESS-2 total and subscale scores ($p<0.05$), while a positive correlation was observed between BAQ scores and COPESS-2 total and subscale scores ($p<0.05$).
These findings suggest that PMS has a considerable impact on the performance-related emotional states of female athletes, and increasing PMS severity may be associated with reductions in both performance mood and body awareness. Understanding the influence of PMS on optimal performance, emotional regulation, and body awareness is crucial for supporting the health and performance of young female athletes.

Keywords: : Premenstrual Syndrome, athletes, athletic performance, emotional regulation.

Özet

Adet Öncesi Sendromu Üniversiteli Kadın Sporcularda Beden Farkındalığını ve Duygusal Performansı Nasıl Etkiler?

Menstrüel döngü boyunca yaşanan hormonal değişimler, kadın sporcuların hem fiziksel hem de psikolojik süreçlerini etkileyebilmektedir. Premenstrual sendrom (PMS), kadınlarda hem fiziksel hem de psikolojik işlevleri etkileyen önemli bir sendromdur. PMS'nin neden olduğu fiziksel ve duygusal değişiklikler, kadın sporcuların performansla ilişkili duygudurumlarını ve bedenlerine yönelik algılarını değiştirebilir. Bu çalışma, PMS'nin üniversiteli kadın sporcularda beden farkındalığı ve performansla ilişkili duygudurum üzerindeki etkisini araştırmayı amaçlamaktadır. Çalışma kesitsel ve gözlemsel bir tasarıma sahiptir. Çalışmaya 412 üniversiteli kadın sporcu dahil edilmiştir. Demografik bilgiler, demografik veri formu aracılığıyla toplanmıştır. Premenstrual sendrom varlığı Premenstrual Sendrom Ölçeği (PMSS) ile değerlendirilmiş, katılımcıların performansla ilişkili duygudurumları ise Sürekli Optimal Performans Duygudurum Ölçeği-2 (SOPDDÖ-2) ile ölçülmüştür. Katılımcıların beden farkındalığı ise Vücut Farkındalığı Anketi (VFA) kullanılarak değerlendirilmiştir. PMS olan ve olmayan sporcular arasında SOPDDÖ-2 toplam ve alt ölçek puanlarında istatistiksel olarak anlamlı bir fark bulunmuştur ($p<0,05$). PMSS ile SOPDDÖ-2 toplam ve alt ölçek puanları arasında negatif bir korelasyon tespit edilmiştir ($p<0,05$). Ayrıca BAQ ile SOPDDÖ-2 toplam ve alt ölçek puanları arasında pozitif bir korelasyon gözlemlenmiştir ($p<0,05$). Premenstrual sendromun kadın sporcularda performansla ilişkili duygudurum üzerinde önemli bir etkisi olduğu ve premenstrual sendrom şiddetinin artmasının, performans duygudurumunda ve beden farkındalığında düşüşlere yol açabileceği düşünülmektedir. Genç kadın sporcularda optimal performans, duygudurum ve beden farkındalığı üzerinde PMS'nin etkilerini anlamak büyük önem taşımaktadır.

Anahtar Kelimeler: Premenstrual Sendrom, sporcular, atletik performans, duygusal düzenleme.

INTRODUCTION

Physiological factors unique to females, like the changing levels of sex hormones across menstrual cycle, play a key role in optimizing performance and supporting the health of female athletes (1). Menstrual cycle is commonly divided into phases such as early follicular, late follicular, ovulatory, early luteal, mid-luteal, and late luteal (2). Variations in hormones like estrogen, progesterone, follicle-stimulating hormone (FSH), and luteinizing hormone (LH) define these phases of the menstrual cycle (3).

Premenstrual Syndrome (PMS) includes a range of physical, emotional, and behavioral symptoms that significantly affect women's daily lives, work, and personal activities (4). While the exact cause of PMS remains unclear, symptom onset is associated with changes in ovarian hormone levels (5). Symptoms are generally categorized into physical, psychological, and behavioral groups. Physical symptoms often include fatigue, bloating, breast tenderness, headaches, weight gain, muscle aches, and swelling in the limbs. Emotional and behavioral symptoms may involve irritability, anxiety, mood swings, sadness, depression, trouble focusing, sleep disturbances, and withdrawal from normal activities (6). PMS is highly prevalent, with a Turkish meta-analysis reporting a 52.2% prevalence rate (7).

The performance emotional state (flow state) has become crucial for addressing how optimal performance experiences reflect the resulting mental and psychological conditions in sports and exercise environments (8). The performance emotional state can be defined as engaging deeply in a specific task and deriving pleasure from the process. This emotional state, which individuals can experience during activities such as sports, arts, or other tasks, is characterized by immersion in the task, cognitive competence, a sense of control over the task, and the inner enjoyment and pleasure derived from the activity (9). As previously mentioned, PMS includes symptoms that can cause significant changes in individuals' moods. Therefore, the symptoms of PMS in female athletes may have effects on their performance and emotional states.

Body awareness is defined as a comprehensive indicator that includes sensory, physiological, and physical dimensions, along with an individual's ability to perceive their own body (10). Among the various factors explored to enhance performance, researchers have focused on achievement goals and body awareness to understand their influence on peak performance in competitive sports, with body awareness gaining particular attention in recent years (11). As a key element in the connection between the body and mind, body

awareness is an important indicator of overall health (12). In a study involving athletes, a connection was found between body awareness levels and performance mood (10). However, research in this area remains limited. Studies examining the effects of changes in body awareness in women with PMS have produced conflicting results (13,14).

Thus, the primary aim of this study is to explore the relationship between PMS, body awareness, and performance emotional state in collegiate female athletes. The secondary aim is to identify differences in body awareness and performance emotional state between collegiate female athletes with and without PMS.

METHOD

Study design

This research was a cross-sectional study involving collegiate female athletes. The study was approved by the Ethical Committee of Kütahya Health Sciences University (ID: 2024/09-08). It was conducted in compliance with Good Clinical Practice guidelines and the Helsinki Declaration. Informed consent was obtained from participants, who were thoroughly briefed on the study's methods and objectives. This manuscript has been written in accordance with the STROBE checklist.

Setting

An online questionnaire was used for the study, distributed via Google Forms using the snowball sampling method. It was anonymous, available in Turkish, and accessible between July 2024 and October 2024. Participants were invited to participate through email and social media networks. The questionnaire consisted of four sections and took approximately 20 minutes to complete.

Participants

The participants of the study were collegiate female athletes between the ages of 18-23. The inclusion criteria were volunteering to participate in the study, being female, being an athlete in a sports branch, and being a native Turkish speaker. Individuals who were male and did not volunteer for the study were excluded.

Variables

Demographic information was collected using a demographic data form. The presence of premenstrual syndrome was evaluated using the Premenstrual Syndrome Scale (PMSS), participants' performance emotional state (PES) was measured with the Continuous Optimal Performance Mood Scale-2 (COPESS-2), and body awareness was assessed through the Body Awareness Questionnaire (BAQ).

Measurements

Demographic Data Form

Demographic characteristics of individuals were evaluated with a demographic data form. Data such as individuals' age, weight, height, body mass index, training frequency in a week, smoking and alcohol use, age at first menarche, menstrual cycle pattern, menstruation length were collected.

Premenstrual Syndrome Symptom Scale

The Premenstrual Syndrome Scale (PMSS), developed by Gencdogan in 2006 based on DSM-III and DSM-IV-R diagnostic criteria, is designed to assess the severity of premenstrual symptoms (15). The scale consists of 44 items rated on a five-point Likert scale ranging from 1 (Never) to 5 (Always). The minimum and maximum scores that can be obtained from the scale are 44 and 220, respectively. As the total PMSS score increases, the severity of premenstrual symptoms is greater. Individuals with a total PMSS score above 110 (50%) are classified as PMS-positive, with scores between 111 and 148 indicating mild PMS, 149 to 184 moderate PMS, and 185 to 220 severe PMS. The scale includes nine subscales: depressed mood, anxiety, fatigue, irritability, depressive thoughts, pain, changes in appetite, sleep disturbances, and bloating. The Cronbach's alpha value of the scale is 0.75, while in this study, it was found to be 0.96.

Continuous Optimal Performance Emotional State Scale-2

The Optimal Performance Emotional State was measured using the Continuous Optimal Performance Emotional State Scale-2 (COPESS-2), developed by Jackson and Eklund (15,16). This scale is designed to assess an individual's general tendency to achieve optimal performance during physical activities. It includes 36 items and evaluates performance across nine sub-dimensions: the balance between challenge and skill, the consolidation of action and awareness, the clarity of goals, the quality of feedback, mission focus, the sensation of control, the reduction of self-awareness, time perception, and the experience of reasoning. Participants rate each item on a 5-point Likert scale from 1 (Never) to 5 (Always), reflecting how often they experience optimal performance in these areas.

Body Awareness Questionnaire

Participants' body awareness was evaluated using the Body Awareness Questionnaire (BAQ), developed by Shields et al. in 1989 (17,18). The questionnaire consists of 18 items, with participants rating each statement on a scale from 1 (Not at all true for me) to 7 (Completely true for me). The total score is calculated by adding the ratings for each item, with a range from 18 to 126. A higher score reflects greater body awareness.

Bias

The study was conducted in a way that minimized bias, ensuring that the results were unbiased and accurately reflect the participants' experiences.

Statistical Analysis

The data for this study were analyzed using SPSS software (IBM SPSS Statistics for Windows, Version 27.0, Armonk, NY). The normality of the data was assessed using the Shapiro-Wilk test. Categorical variables were expressed as frequencies (percentages) (n [%]) and analyzed using the chi-square test. Continuous variables were presented as means and standard deviations (mean ± SD). Given that the data did not follow a normal distribution, the Mann-Whitney U test was used to compare the two groups. Spearman's rank correlation analysis was conducted to explore the relationships between parameters within the groups of participants with and without PMS. A p-value of less than 0.05 was considered statistically significant.

FINDINGS

Table 1. Sociodemographic and clinical characteristics of the participants

	Participants with PMS *(n=285)*	**Participants without PMS *(n=127)***	***p***
Age (years), X±SD	20.27±2.18	20.83±2.73	0.112
Height (cm), X±SD	165.79±6.73	166.04±6.97	0.827
Weight (kg), X±SD	57.34±8.58	57.91±7.52	0.264
BMI (kg/m^2), X ± SD	20.81±2.46	21.00±2.40	0.533
Training/week	4.02±1.68	4.43±1.58	0.013*
Age of menarche (years), X ± SD	13.71±1.46	13.47±1.46	0.406
Menstrual cycle (days), X ± SD	28.48±4.51	29.21±6.50	0.249
Menstruation length (days), X ± SD	5.47±1.29	5.15±1.18	0.018*
Regular menstrual cycle, n (%)			
Yes	193 (%67.7)	92 (%72.4)	0.338
No	92 (%32.3)	35 (%27.6)	
Smoking status, n (%)			
Yes	104 (%36.5)	35 (%27.6)	0.077
No	181 (%63.5)	92 (%72.4)	
Alcohol using status, n (%)			
Yes	61 (%21.4)	28 (%22.0)	0.883
No	224 (%78.6)	99 (%78.0)	
Branch			
Team	190 (%66.7)	84 (%66.1)	0.917
Individual	95 (%33.3)	43 (%33.9)	
P<0.05			

Table 2. Comparison between groups

	Participants with PMS (*n=285*)	**Participants without PMS (*n=127*)**	***P*[a]**
PMSS	149.04±23.41	89.95±18.37	**<0.001***
BAQ	86.50±17.57	88.77±18.59	0.189
COPESS-2			
Total Score	131.00±19.86	137.12±23.01	**<0.001***
Quest Difficulty - Skill Balance	15.04±3.63	15.48±3.13	**0.022***
Action-Awareness Consolidation	13.69±2.59	14.01±3.43	0.164
Open Targets	15.29±2.96	16.31±3.21	**<0.001***
Specific Feedback	14.69±2.98	15.78±3.19	**<0.001***
Mission Focus	14.47±2.97	15.59±3.18	**<0.001***
Control Sensation	14.44±2.99	15.51±2.99	**<0.001***
Decreasing Self-Awareness	12.96±4.09	14.07±3.89	**0.015***
Time Conversion	14.60±3.03	13.83±3.41	0.067
Experiencing Reasoning	16.03±2.75	16.40±3.17	0.064

Table 3. Correlation between PMSS scores, body awareness, optimal performance state and its sub-dimensions

		PMSS	**BAQ**
PMSS	Spearman's correlation	1.000	.012
	Sig. (2-tailed)	.	.815
	N	412	412
BAQ	Spearman's correlation	.012	1.000
	Sig. (2-tailed)	.815	.
	N	412	412
COPESS-2/Total Score	Spearman's correlation	-.81	.370
	Sig. (2-tailed)	**.000***	**.000***
	N	412	412
COPESS-2/Quest Difficulty - Skill Balance	Spearman's correlation	-.102	.329
	Sig. (2-tailed)	**.038***	**.000***
	N	412	412
COPESS-2/Action-Awareness Consolidation	Spearman's correlation	.067	.224
	Sig. (2-tailed)	.176	**.000***
	N	412	412
COPESS-2/Open Targets	Spearman's correlation	-.182	.322
	Sig. (2-tailed)	**.000***	**.000***
	N	412	412
COPESS-2/Specific Feedback	Spearman's correlation	-.179	.287
	Sig. (2-tailed)	**.000***	**.000***
	N	412	412
COPESS-2/Mission Focus	Spearman's correlation	-.228	.327
	Sig. (2-tailed)	**.000***	**.000***
	N	412	412
COPESS-2/Control Sensation	Spearman's correlation	-.231	.332
	Sig. (2-tailed)	**.000***	**.000***
	N	412	412
COPESS-2/Decreasing Self-Awareness	Spearman's correlation	-.135	.150
	Sig. (2-tailed)	**.006***	**.002***
	N	412	412
COPESS-2/Time Conversion	Spearman's correlation	.116	.143
	Sig. (2-tailed)	**.019***	**.004***
	N	412	412
COPESS-2/Experiencing Reasoning	Spearman's correlation	-.091	.391
	Sig. (2-tailed)	.066	**.000***
	N	412	412

A total of 510 young female athletes initially participated in the study. However, due to incomplete questionnaires and errors in responses, the final analysis was based on 412 participants. Table 1 presents the demographic data of the participants across the groups. A statistically significant difference was found between the training frequencies and menstrual cycle lengths of individuals with PMS and those without PMS ($p<0.05$). No statistically significant differences were observed between the two groups for other demographic variables ($p>0.05$).

Table 2 presents the comparisons of BAQ, COPESS-2 Total, Quest Difficulty-Skill Balance, Action-Awareness Consolidation, Open Targets, Specific Feedback, Mission Focus, Control Sensation, Decreasing Self-Awareness, Time Conversion, and Experiencing Reasoning. Statistically significant differences were found between individuals with PMS and those without PMS in COPESS-Total Score, Quest Difficulty-Skill Balance, Open Targets, Specific Feedback, Mission Focus, Control Sensation, and Decreasing Self-Awareness ($p<0.05$). No significant differences were observed in BAQ, Action-Awareness Consolidation, Time Conversion, or Experiencing Reasoning between the two groups ($p>0.05$).

Table 3 showed the correlation between PMSS scores, body awareness, optimal performance state and its sub-dimensions. There was negative correlation between PMSS and COPESS-Total Score ($r=-0.181$, $p=0.000$), COPESS-2/Quest Difficulty - Skill Balance ($r=-0.102$, $p=0.038$), COPESS-2/Open Targets ($r=-0.182$, $p=0.000$), COPESS-2/Specific Feedback ($r=-0.179$, $p=0.000$), COPESS-2/Mission Focus ($r=-0.228$, $p=0.000$), COPESS-2/ Control Sensation ($r=-0.231$, $p=0.000$), COPESS-2/Decreasing Self-Awareness ($r=-0.135$, $p=0.006$). There was a positive correlation between PMSS and COPESS-2/Time Conversion ($r=0.116$, $p=0.019$). There was positive correlation between BAQ and COPESS-Total Score ($r=0.370$, $p=0.000$), COPESS-2/ Quest Difficulty - Skill Balance ($r=0.329$, $p=0.000$), COPESS-2/ Action-Awareness Consolidation ($r=0.224$, $p=0.000$), COPESS-2/Open Targets ($r=0.322$, $p=0.000$), COPESS-2/Specific Feedback ($r= 0.287$, $p= 0.000$), COPESS-2/ Mission Focus ($r=0.327$, $p=0.000$), COPESS-2/ Control Sensation ($r=0.332$, $p=0.000$), COPESS-2/Decreasing Self-Awareness ($r=0.150$, $p=0.002$), COPESS-2/Time Conversion ($r=0.143$, $p=0.004$), COPESS-2/Experiencing Reasoning ($r=0.391$, $p=0.000$). There was no correlation between PMSS and BAQ, COPESS-2/Action-Awareness Consolidation, COPESS-2/Experiencing Reasoning ($p>0.05$).

DISCUSSION AND CONCLUSION

This study investigated the relationship between the severity of PMS, body awareness, and performance emotional states in collegiate female athletes. It also examined the differences in body awareness and performance emotional states between athletes with and without PMS. The results revealed that female athletes with PMS experienced a greater impact on performance-related emotional states, although no differences in body awareness were observed between the groups. Furthermore, as the severity of PMS increased, performance-related emotional states were more negatively affected, while body awareness remained unaffected. An additional key finding was that higher body awareness was associated with a positive improvement in performance emotional states in collegiate female athletes.

To the best of our knowledge, this study is the first to investigate the effects of PMS on body awareness and performance emotional states in collegiate female athletes. A meta-analysis of 17 studies examining the global prevalence of PMS found a rate of 47.8% (19). A more recent systematic review of 18 studies, which included 6890 female participants from Turkey, reported an overall prevalence of 52.2% for PMS (7). Research on PMS prevalence in athletes is limited. A study in Poland involving middle to long-distance female athletes found the prevalence of PMS to be 49.33% (20), while a study in Japan with 232 female athletes reported a prevalence of 44.3% (21). In the present study, conducted with young female athletes in Turkey, we found the prevalence of PMS to be 69.2%, which may be higher than the general population in Turkey.

One of the important factors affecting athletes' peak performance is performance emotional state (22). Studies have reported a positive relationship between optimal emotional state and subjective performance measurements in a wide variety of individual and team sports (23–26). The mechanisms explaining the mood changes caused by PMS have not yet been definitively determined. However, studies have suggested that an increase in inflammatory responses in the body may lead to various mood changes (27). These increases can cause elevated levels of pro-inflammatory cytokines and other inflammatory markers. Pro-inflammatory

cytokines can affect the balance of neurotransmitters in the brain, leading to mood changes such as depression, anxiety, and irritability (28,29).

These processes may affect the performance and satisfaction with performance of athletes with PMS. Therefore, a more detailed examination of the effects of PMS-related processes on emotional state is important for understanding and managing the effects of PMS on performance in athletes. Therefore, in our study, we examined the effect of PMS on optimal performance emotional state in young female athletes. To the best of our knowledge, this is the first study to examine the effect of PMS on optimal performance emotional state in female athletes. As a result of our study, we found that the total score of optimal performance emotional state was significantly lower in athletes with PMS. We also found that optimal performance emotional state decreased as PMS severity increased. Significant differences were found in the sub-dimensions of Quest Difficulty-Skill Balance, Open Targets, Specific Feedback, Mission Focus, Control Sensation, and Decreasing Self-Awareness, while no differences were found in the sub-dimensions of Action-Awareness Consolidation, Time Conversion, and Experiencing Reasoning. Considering that PMS causes many emotional and physical symptoms, the finding that athletes with PMS have significantly lower optimal performance emotional states supports our hypothesis.

In the literature, studies investigating the effect of PMS on body awareness are limited and the existing results are contradictory. A study by Kleinstäuber et al. reported that women with PMS have higher body awareness compared to women without PMS (14). Kiloatar et al. reported that body awareness in women with PMS was relatively lower compared to women without PMS, although the difference was not significant (30). In our study, we also found that body awareness in athletes with PMS was lower compared to athletes without PMS, although the difference was not significant. Body awareness has different sub-dimensions, including physical, physiological, psychosocial, and existential (31). The reason for the lack of a significant difference may be that the scale used to assess body awareness is based on self-report, and therefore may not fully reflect every dimension of body awareness.

Athletes should pay a certain level of attention to their physical and emotional processes; this can encourage the ability to better recognize self-regulation and inner sensations (32). Additionally, to maintain optimal performance and assess whether they are staying at the top, they need to have a high level of body awareness (11). In this study, we found that female athletes with higher body awareness had better optimal performance emotional state.

Erden et al., in their study involving athletes from different disciplines, found similar results to our study regarding body awareness and optimal performance emotional state (10). Additionally, Erkmen and Aşçı's study indicated that body awareness can influence emotional state, which may enhance an individual's enjoyment of exercise and contribute to continued engagement in physical activity (33). Athletes with high body awareness may better understand their emotional and mental states during performance, which could have contributed to these outcomes.

Our study has some limitations. First, since our assessment methods rely on participants' self-reports, they may include subjective differences and perceptual biases. Second, the athletes included in this study are both individual and team players. Because there may be differences in motivation across different sports disciplines, this could limit the generalizability of the results.

In conclusion, this study is significant as it is the first to highlight the impact of PMS on performance emotional state and body awareness in young female athletes. It has been observed that performance emotional state may be more significantly affected in female athletes with PMS. An increase in the severity of PMS can negatively impact performance mood and body awareness. It is already known that the menstrual cycle affects performance in female athletes, and this has been demonstrated in various studies in the literature. With the addition of PMS symptoms, more pronounced negative effects on athletes' mood and sports performance emerge. The high prevalence of PMS can significantly impact athletes' emotional states and, consequently, their performance. Therefore, it is crucial for athletes, coaches, trainers, sports therapists, and other professionals working with athletes to consider this situation.

There is a need for further research to better understand the factors affecting performance mood in collegiate female athletes with PMS and to examine the impact of treatment approaches for PMS on emotional performance states in these athletes. Developing strategies to alleviate PMS symptoms and assessing their effects on athletes' performance could contribute to the development of healthier and more effective athletes, both individually and at the team level. Additionally, increasing educational programs and awareness initiatives to reduce the impact of PMS on sports performance will help athletes manage their mental and physical health more effectively.

Disclosure/Conflict of Interest Statement

No potential conflict of interest was reported by the authors.

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Data Availability Statement

Data is available upon reasonable request from the corresponding author.

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Ethical approval and institutional permission

The study was approved by the Ethical Committee of Kütahya Health Sciences University (ID: 2024/09-08).

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