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Research Article

# The effects of mindfulness levels on menstrual symptoms and irritability in university students

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## ABSTRACT

**Objective:** This study aims to determine the effects of mindfulness levels on menstrual symptoms and irritability among university students.

**Methods:** This descriptive cross-sectional study was conducted between February and March 2025 with 274 female university students aged 18–49 years residing in a women's dormitory in Ankara. Data were collected using a Personal Information Form, the Five Facet Mindfulness Questionnaire (FFMQ), the Menstrual Symptom Questionnaire (MSQ), and the Born–Steiner Irritability Scale (BSIS). Descriptive statistics and Pearson correlation analysis were employed for data analysis.

**Results:** The participants' mean age was 20.82 ± 2.12 years. The mean total scores were 126.25 ± 14.47 for FFMQ, 73.24 ± 18.18 for MSQ, and 26.25 ± 8.23 for BSIS. A moderate positive correlation was identified between menstrual symptoms and irritability.

**Conclusion:** Different subdimensions of mindfulness exert varying effects on menstrual symptoms and irritability. Notably, the Acting with Awareness skill emerged as the most effective factor in reducing both menstrual symptoms and irritability. These findings suggest that mindfulness-based intervention programs can be integrated into primary care services for female patients in family medicine practice, and family physicians can utilize holistic approaches in menstrual symptom management.

**Keywords:** mindfulness, menstruation, premenstrual syndrome, primary health care

## Introduction

The menstrual cycle, a natural and physiological process that reflects a woman's reproductive capacity, begins after puberty and continues at regular intervals until menopause.[1] Due to the cyclical changes occurring throughout menstrual cycles, women may encounter various problems either during menstruation or in the premenstrual period.[2]

The most commonly reported issues during this process include dysmenorrhea, amenorrhea, menorrhagia, abnormal uterine bleeding, and premenstrual syndrome (PMS).[3]

Premenstrual syndrome (PMS) is a condition that manifests in the late luteal phase of the

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menstrual cycle, emerging roughly one week before the onset of menstruation and subsiding in the days following its onset, accompanied by physical, emotional, and psychological symptoms.[4,5] Although the precise etiology of PMS has not been fully elucidated, factors such as genetic predisposition, ovarian activity, levels of hormones such as estradiol and progesterone, imbalance in the renin–angiotensin system, various psychological and sociodemographic factors (e.g., age, place of residence, marital status), cigarette and alcohol consumption, intake of caffeinated beverages, engagement in physical exercise, dietary habits high in fat, sexual activity, prolonged menstrual cycles, and age at menarche are considered to play a role.[6-8]

According to the American College of Obstetricians and Gynecologists (ACOG), PMS symptoms are classified into two categories: affective and somatic. Affective symptoms include depression, anger episodes, confusion, irritability, anxiety and social isolation, whereas somatic symptoms encompass breast swelling and sensitivity, abdominal distension, headaches, and swelling of the extremities.[2,9] Among these symptoms, irritability has been reported as one of the most prominent and long-lasting manifestations of PMS.[10,11]

Irritability is defined as an emotional response that emerges when an individual's ability to regulate mood is diminished and typically presents as verbal or behavioral outbursts of anger.[12] A reduction in estrogen and progesterone levels is thought to be a major factor contributing to the onset of irritability.[13] In a study conducted by Schmelzer et al.[14], irritability and depressed mood were reported among the most common symptoms associated with PMS.

The literature indicates that while approximately 75% of women experience PMS, between 3% and 8% suffer from severe PMS.[15] The prevalence of PMS has been shown to vary across countries, with studies reporting rates of 34% in China, 71% in Türkiye, 80% in Pakistan, and 92% in Jordan.[6] In India, the prevalence has been reported to range between 14.3% and 74.4%.[16] These symptoms have been found to adversely affect women's and particularly female university students'social and family relationships, physical activities, emotional well-being, academic performance, and overall quality of life.[17,18] In Türkiye, various studies have reported PMS prevalence among university students ranging from 36.4% to 76.2%.[19,20] Despite its high prevalence, many individuals remain unaware of PMS.[21]

When considered in the context of women's health, mindfulness may have a significant impact on physiological processes such as the menstrual cycle. Individuals with high levels of mindfulness—characterized by acceptance of oneself, finding meaning in life, openness to growth, and the ability to establish sound social relationships are regarded as psychologically more balanced.[22] These qualities may exert a protective or symptom-alleviating effect, particularly on the emotional manifestations accompanying PMS, such as irritability. Although numerous studies have investigated the physical symptoms of the menstrual cycle and methods to alleviate them, research on the relationship between mindfulness and irritability remains limited.

This study aims to determine the effect of mindfulness levels on the severity of menstrual symptoms and irritability among university students, thereby addressing a gap in the existing literature.

## Materials and Methods

### Study setting and design

This research was designed as a cross-sectional descriptive study and was conducted between February and March 2025 among female residents aged 18-49 in a Higher Education Women's

Dormitory in Ankara. The lower age limit was set at 18 years to ensure autonomous informed consent in accordance with ethical regulations and institutional review board requirements. The upper age limit of 49 years was determined based on the World Health Organization's definition of reproductive age (15-49 years) and to capture the full range of women residing in dormitory facilities. Although reproductive health surveillance typically covers ages 15-49, participants under 18 were excluded due to the requirement for parental/guardian consent, which would have introduced significant practical and logistical challenges in the dormitory setting where residents are predominantly adults. The study was reported in accordance with the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) guidelines.

### Participants and data collection

The study population consisted of female residents aged 18–49 living in a women's dormitory in Ankara (N = 700). The sample size was calculated using a single population proportion formula with a 5% margin of error and 95% confidence level, yielding a minimum required sample of n = 249. To account for potential non-response and data loss, the sample was increased by 10% to n = 274. The study was completed with a total of 274 participants. During the data collection process, participants were provided with an informed consent form**. After obtaining written informed consent,** questionnaires were administered face-to-face by the researcher in a private setting to ensure confidentiality.

Inclusion Criteria: Participants were included if they were aged between 18 and 49 years, resided in the women's dormitory, volunteered to participate in the research, and were literate in Turkish.

Exclusion Criteria: Those who did not volunteer to participate, were younger than 18 or older than 49 years, or failed to complete the questionnaires in full were excluded from the study.

Ethics Committee Approval: The study was approved by the Ankara Medipol University Ethics Committee. Written informed consent was obtained from all participants.

### Data collection instruments

No clinical, surgical, or laboratory examinations were performed in this study; all data were collected through questionnaires.

Personal Information Form: A 12-item form developed by the researchers based on a literature review.

Five Facet Mindfulness Questionnaire (FFMQ): Developed by Baer et al.[23] and adapted into Turkish by Kınay et al.[24] The 39-item, 5-point Likert-type scale comprises five subdimensions: Observing, Describing, Acting with Awareness, Nonjudging of Inner Experience, and Nonreactivity to Inner Experience. In the present study, the Cronbach's alpha coefficient was found to be .792.

Menstrual Symptom Questionnaire (MSQ): Developed by Chesney and Tasto[25] in 1975, updated by Negriff et al.[26] in 2009, and adapted into Turkish by Güvenç et al.[27] The 22-item, 5-point Likert-type scale consists of three subdimensions: Negative Effects/Somatic Complaints, Menstrual Pain Symptoms, and Coping Methods. In the present study, the Cronbach's alpha coefficient was .933.

Born–Steiner Irritability Scale: Self-Report Form (BSIS): This scale, specifically developed for women, consists of two parts: the first 14 items assess situational irritability levels, while the visual analog section containing 7 items evaluates functionality levels. In the present study, the Cronbach's alpha coefficient was .912.

### Statistical analysis

Data were analyzed using the SPSS 25.0 software package. Descriptive statistics (frequency, percentage, mean, and standard deviation) were

used for data summarization. The normality of the data distribution was assessed using the Kolmogorov–Smirnov test. Pearson correlation analysis was used to examine relationships between variables. The reliability of the scales was evaluated using Cronbach's alpha coefficients. A significance level of $p < 0.05$ was adopted. Correlation coefficients were interpreted as follows: values below 0.30 were considered low, between 0.30 and 0.70 moderate, and above 0.70 high.

## Results

This section presents the findings of the study in three main parts:[1] descriptive characteristics of the participating university students (sociodemographic and reproductive health-related variables),[2] descriptive statistics of the measurement instruments used in the study (means, standard deviations, minimum and maximum scores for each scale), and[3] correlation analyses examining the relationships between the main study variables. Statistical significance was evaluated at an alpha level of $p < 0.05$ for all analyses

### Descriptive statistics

A total of 274 female university students participated in the study. The mean age of participants was 20.82 ± 2.12 years. Of the students, 36.1% (n = 99) were in their second year, and 30.3% (n = 83) were in their first year. In terms of faculty distribution, the highest participation was from the Faculty of Health Sciences (42.0%, n = 115). Regarding parental education levels, 34.7% (n = 95) of mothers and 57.7% (n = 158) of fathers were graduates of college or university. A majority of participants (84.3%, n = 231) lived in a nuclear family structure, and 75.6% (n = 207) reported having regular menstruation (Table 1).

### Descriptive statistics of scale scores

The mean total score of the Five Facet Mindfulness Questionnaire was 126.25 ± 14.47. Among its subdimensions, Acting with Awareness had the highest mean score (27.11 ± 6.15), while Nonreactivity to Inner Experience had the lowest (17.42 ± 3.98). The other subdimension scores were as follows: Describing 26.97 ± 5.54, Observing 25.66 ± 6.81, and Nonjudging of Inner Experience 19.94 ± 5.63. The mean total score of the Menstrual Symptom Questionnaire was 73.24 ± 18.18. Among its subdimensions, Negative Effects/Somatic Complaints had the highest mean score (42.74 ± 11.45), while Coping Methods had the lowest (8.85 ± 3.55). The mean score for Menstrual Pain Symptoms was 21.64 ± 5.60. The mean score of the Born–Steiner Irritability Scale was 26.25 ± 8.23 (Table 2).

### Relationships between mindfulness and menstrual symptoms

Pearson correlation analysis was conducted to examine the relationships between mindfulness subdimensions and menstrual symptoms. The results indicated several significant associations between different mindfulness subdimensions and menstrual symptoms. The Observing subdimension showed positive and significant correlations with menstrual symptoms: Menstrual Pain Symptoms ($r = .280$, $p < .001$), Negative Effects/Somatic Complaints ($r = .188$, $p = .002$), and the MSQ total score ($r = .221$, $p < .001$). No significant relationship was found with Coping Methods ($r = .081$, $p = .182$). The Acting with Awareness subdimension demonstrated negative and significant correlations with menstrual symptoms: MSQ total score ($r = –.270$, $p < .001$), Negative Effects/Somatic Complaints ($r = –.282$, $p < .001$), Menstrual Pain Symptoms ($r = –.187$, $p = .002$), and Coping Methods ($r = –.180$, $p = .003$). The Nonjudging of Inner Experience subdimension showed negative and significant correlations with menstrual symptoms: Menstrual Pain Symptoms

| **Table 1.** Findings on students' descriptive characteristics | | |
|---|---|---|
| **Variable** | | |
| Age (Mean ± SD) | 20.82±2.12 | |
| | **n** | **%** |
| Mother's Educational Status | | |
| Illiterate | 3 | 1.1 |
| Literate / Elementary school graduate | 59 | 21 |
| Middle school graduate | 40 | 14.6 |
| High school graduate | 77 | 28.1 |
| College/University graduate | 95 | 34.7 |
| Father's Educational Status | | |
| Illiterate | 1 | 0.4 |
| Literate / Elementary school graduate | 28 | 10.2 |
| Middle school graduate | 31 | 11.3 |
| High school graduate | 56 | 20.4 |
| College/University graduate | 158 | 57.7 |
| Family Income Status | | |
| Low | 7 | 2.6 |
| Medium | 182 | 66.4 |
| Good | 85 | 31.0 |
| Family Type | | |
| Nuclear | 231 | 84.3 |
| Traditional | 39 | 14.2 |
| Fragmented | 4 | 1.5 |
| Menstrual Cycle | | |
| Regular | 207 | 75.6 |
| Irregular | 67 | 24.4 |

n=number of participants, %=percentage

(r = –.289, p < .001), MSQ total score (r = –.277, p < .001), Negative Effects/Somatic Complaints (r = –.245, p < .001), and Coping Methods (r = –.170, p = .005). The Nonreactivity to Inner Experience subdimension displayed positive and significant correlations with menstrual symptoms: MSQ total score (r = .138, p = .022), Menstrual Pain Symptoms (r = .134, p = .026), and Coping Methods (r = .128, p = .034). No significant relationship was observed with Negative Effects/Somatic Complaints (r = .144, p = .059). The Describing subdimension was not significantly associated with any menstrual symptom variable (p> .05) (Table 3).

| **Table 2.** Descriptive statistics for scales | | | | |
|---|---|---|---|---|
| **Scale / Subscale** | **Mean** | **SD** | **Min** | **Max** |
| Five Facet Mindfulness Questionnaire | 126.25 | 14.47 | 85 | 165 |
| - Observation | 25.66 | 6.81 | 9.00 | 40.00 |
| - Description | 26.97 | 5.54 | 8.00 | 40.00 |
| - Mindful Behavior | 27.11 | 6.15 | 8.00 | 40.00 |
| - Non-judgmental attitude toward internal experiences | 19.94 | 5.63 | 7.00 | 35.00 |
| - Indifference | 17.42 | 3.98 | 6.00 | 30.00 |
| Menstrual Symptom Questionnaire (MSQ | 73.24 | 18.18 | 22.00 | 110.00 |
| - Negative Effects / Somatic Complaints | 42.74 | 11.45 | 1.00 | 65.00 |
| - Menstrual Pain Symptoms | 21.64 | 5.60 | 6.00 | 30.00 |
| - Coping Methods | 8.85 | 3.55 | 3.00 | 15.00 |
| Born-Steiner Irritability (BSIS) | 26.25 | 8.23 | 13.00 | 52.00 |

SD = Standard Deviation; Min = Minimum value; Max = Maximum

### Relationships between mindfulness and irritability

Pearson correlation analysis was conducted to determine the relationships between mindfulness subdimensions and irritability levels (Table 4).

The Acting with Awareness subdimension demonstrated a modarate and significant negative correlation with irritability (r =–.441, p <.001), indicating that higher acting-with-awareness skills are associated with lower irritability levels. The Describing subdimension exhibited a significant negative correlation with irritability (r =–.164, p = .007), suggesting that the ability to label emotional experiences contributes to reducing irritability. The total FFMQ score had a moderate and significant negative correlation with irritability (r = –.310, p <.001), showing that higher overall mindfulness levels are associated with lower irritability. No significant relationships were found between irritability and the Observing (r = –.035, p = .567), Nonjudging of Inner Experience (r = –.076, p = .208), or Nonreactivity to Inner Experience (r = –.041, p = .501) subdimensions.

These findings indicate that the behavioral and cognitive dimensions of mindfulness are more effective in reducing irritability.

**Table 3.** Correlation between mindful awareness and menstrual symptoms

| Mindfulness Subscale | Negative Effects (r/p) | Menstrual Pain (r/p) | Coping methods (r/p) | MSQ Total (r/p) |
|---|---|---|---|---|
| Observation | r = .188**<br>p = .002 | r = .280**<br>p = .000 | r = .081<br>p = .182 | r = .221**<br>p = .000 |
| Description | r = .041<br>p =.499 | r = .083<br>p = .170 | r = .003<br>p =.959 | r = .052<br>p =.391 |
| Mindful Behavior | r = -.282**<br>p = .000 | r = -.187**<br>p = .002 | r = -.180**<br>p = .003 | r = -.270**<br>p = .000 |
| Non-judgmental attitude toward internal experiences | r = -.245**<br>p = .000 | r = -.289**<br>p = .000 | r =-.170**<br>p =.005 | r = -.277**<br>p =.000 |
| Indifference to Internal Experiences | r = .144<br>p = .059 | r = .134*<br>p = .026 | r = .128*<br>p = .034 | r = .138*<br>p = .022 |
| FFMQ Total | r = -0.099<br>p = .101 | r = -0.022<br>p = .711 | r = -0.080<br>p =.189 | r = -0.085<br>p = .160 |

*p < .05, **p < .01; FFMQ=Five Facet Mindfulness Questionnaire Scale; MSQ= Menstrual Symptom Questionnaire

### Overall relationships between mindfulness, menstrual symptoms, and irritability

To illustrate the relationships among all variables examined in the study, a correlation matrix was constructed (Table 5).

Among mindfulness subdimensions, moderate positive correlations were found between Observing and Describing (r = .572, p < .001), and between Observing and Nonreactivity to Inner Experience (r = .566, p < .001). A moderate negative correlation was observed between Observing and Nonjudging of Inner Experience (r = –.582, p < .001). The Describing subdimension demonstrated a moderate positive correlation with Nonreactivity to Inner Experience (r = .392, p < .001), a weak positive correlation with Acting with Awareness (r = .238, p < .001), and a moderate negative correlation with Nonjudging of Inner Experience (r = –.326, p < .001). Acting with Awareness exhibited a weak positive correlation with Nonjudging of Inner Experience (r = .287, p < .001) and a weak negative correlation with Nonreactivity to Inner Experience (r = –.199, p < .001).

A moderate negative correlation was found between Nonjudging of Inner Experience and Nonreactivity to Inner Experience (r = –.479, p < .001). A moderate and significant positive correlation was observed between menstrual symptoms and irritability (r = .433, p < .001), indicating that as menstrual symptoms increase, irritability levels also rise.

**Table 4.** Correlations between mindfulness and born-steiner irritability

| Mindfulness subscale | BSIS total (r/p) |
|---|---|
| Observation | r = -.035<br>p =.567 |
| Description | r = -.164**<br>p =.007 |
| Mindful Behavior | r = -.441**<br>p =.000 |
| Non-judgment of Internal Experiences | r = -.076<br>p =.208 |
| Indifference to Internal Experiences | r = -.041<br>p = .501 |
| FFMQ Total | r = -.310**<br>p =.000 |

*p < .05, **p < .01; FFMQ=Five Facet Mindfulness Questionnaire; BSIS= Born-Steiner Irritability Scale

**Table 5.** Correlation matrix between mindfulness, menstrual symptoms, and irritability

| Variables | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| FFMQ_Observation | 1 | | | | | | |
| FFMQ_Identification | .572 | 1 | | | | | |
| FFMQ_Mindful Behavior | –.061 | .238 | 1 | | | | |
| FFMQ_Nonjudgmental | –.582 | –.326 | .287 | 1 | | | |
| FFMQ_Indifference | .566 | .392 | –.199 | –.479 | 1 | | |
| MSQ total | .221 | .052 | –.270 | –.277 | .138 | 1 | |
| BSIS Total | –.035 | –.164 | –.441 | –.076 | –.041 | .433 | 1 |

*p < .05, **p < .01
FFMQ=Five Facet Mindfulness Questionnaire; MSQ= Menstrual Symptom Questionnaire; BSIS=Born-Steiner Irritability Scale

## Discussion

The critical findings of this study demonstrate that different subdimensions of mindfulness exert distinct effects on menstrual symptoms and irritability, offering important new insights in this field. When compared with the existing literature, the primary results of our research are both supportive of previous findings and innovative in certain respects.

A key finding of the present study is the moderate positive correlation between menstrual symptoms and irritability. This result aligns with recent research examining the effect of them menstrual cycle upon psychiatric symptoms.[28] In a longitudinal study conducted in the United States, it was observed that women's suicidal ideation increased and irritability levels markedly rose in the luteal stage of the menstrual cycle.[28] Similarly, in a study by Aba et al.[29] involving Turkish university students, the prevalence of irritability among individuals experiencing premenstrual syndrome was found to be 79.2%, and this condition was reported to negatively affect quality of life. These results provide strong support for the main hypothesis of our study.

In our research, the Acting with Awareness subdimension demonstrated moderate negative correlations with both menstrual symptoms and irritability, revealing its dual protective effect. This finding is consistent with systematic reviews examining the effects of mindfulness interventions on women's health.

A comprehensive meta-analysis published in 2024 reported that mindfulness-based interventions significantly reduced symptoms of irritability, depression, and anxiety in menopausal women.[30] Similarly, in a 2019 study conducted at the Mayo Clinic by Sood et al.[31], it was found that middle-aged women with higher mindfulness scores had significantly lower levels of irritability, depression, and anxiety. A particularly noteworthy result in our study is that the Observing subdimension was positively correlated with menstrual symptoms but not significantly associated with irritability. This finding highlights the complex effects of the observing dimension of mindfulness.

In a pioneering research exploring the connection between premenstrual symptoms and mindfulness, the observing dimension was positively correlated with the reporting of premenstrual symptom severity; however, it was suggested that this relationship may not reflect an actual increase in symptoms but rather an enhanced awareness of them.[32] This interpretation aligns perfectly with our own results. In our study, the Nonjudging of Inner Experience subdimension was strongly negatively correlated with menstrual symptoms but showed no significant association with irritability. This suggests that nonjudgmental

attitudes are particularly effective in shaping the experience of physical symptoms.

In a study conducted by Keng et al.[33], the nonjudging dimension of mindfulness was found to increase happiness levels in women while reducing symptoms of anxiety and depression. This supports the regulatory role of nonjudgmental attitudes on both emotional and physical experiences. The Describing subdimension demonstrated no significant association with menstrual symptoms but was negatively correlated with irritability, indicating that it may be more influential in emotional regulation processes. A large-scale meta-analysis by Galante et al.[34], using individual participant data, showed that the describing dimension of mindfulness was particularly effective in reducing psychological distress. This finding is in agreement with the results of our study.

The Nonreactivity to Inner Experience subdimension exhibited a positive correlation with menstrual symptoms and no significant association with irritability, revealing an unexpected effect profile in the context of menstrual symptoms.

### Clinical and practical implications

Our findings suggest that the differential effects of mindfulness subdimensions should be taken into account when designing mindfulness-based interventions. In particular, programs focusing on the development of Acting with Awareness skills may be effective in reducing both menstrual symptoms and irritability. To our knowledge, this is the first study to identify Acting with Awareness as the specific mindfulness facet that uniquely predicts menstrual symptom reduction in dormitory-dwelling young women, a population previously underrepresented in mindfulness and reproductive health research. This specificity offers practical advantages over broad mindfulness programs by enabling more targeted, efficient, and cost-effective interventions tailored to menstrual health needs. In a randomized controlled trial conducted by Economides et al.[35] using a smartphone application, even brief mindfulness training was shown to produce significant improvements in stress, negative affect, and irritability levels. Our study extends these findings by identifying which specific mindfulness component drives these effects in the context of menstrual health, thereby bridging a critical gap between general mindfulness research and reproductive health applications.

## Conclusion

The findings of this study indicate that mindfulness plays a significant role in the management of menstrual symptoms and irritability. In particular, the skill of Acting with Awareness emerged as the most influential factor in reducing both menstrual symptoms and irritability levels, underscoring the importance of developing intervention programs that specifically target this dimension. When considered alongside existing literature, mindfulness based approaches may be proposed as viable alternatives to traditional coping strategies for managing menstrual-related challenges. Specifically, we recommend:[1] developing brief (10-15 minute) smartphone-based programs focusing on Acting with Awareness exercises such as mindful walking and body scans[2], integrating these programs into university health services and dormitory wellness initiatives, and[3] prioritizing Acting with Awareness training over comprehensive mindfulness programs to enhance time-efficiency and student acceptability.

### Strengths and limitations

The methodological strength of this study lies in its separate examination of the effects of different mindfulness subdimensions on menstrual symptoms and irritability. However, several limitations warrant consideration. First, the cross-sectional design precludes causal inferences and

cannot rule out reverse causality. Second, self-report measures may introduce recall and social desirability biases. Third, important confounding variables were not controlled, including hormonal contraceptive use, sleep quality, stress levels, caffeine/alcohol consumption, exercise habits, BMI, and gynecological history—all of which could independently affect both mindfulness and menstrual symptoms. Fourth, the single-site dormitory sample limits generalizability to other populations and settings. Fifth, exclusion of participants under 18 years restricts generalizability to the full WHO-defined reproductive age range (15-49 years). Finally, mindfulness practice duration and consistency were not assessed, which may moderate observed relationships. Future research employing longitudinal designs and intervention studies with adequate control for confounding factors will help to expand the knowledge base in this area. Randomized controlled trials directly comparing Acting with Awareness-focused interventions to standard programs would strengthen causal evidence.In light of these findings, it is recommended that mindfulness-based intervention programs for women experiencing menstrual symptoms be developed, with particular emphasis on strengthening Acting with Awareness skills.

## Ethical approval

The study was approved by Ankara Medipol University Ethics Committee (date: 13.03.2025, number: 41). Written informed consent was obtained from all participants.

## Author contribution

The authors declare contribution to the paper as follows: Study conception and design: S.C., R.C.B., A.M.S.; data collection: R.C.B., A.M.S.; analysis and interpretation of results: S.C., R.C.B.; draft manuscript preparation: R.C.B., A.M.S. All authors reviewed the results and approved the final version of the article.

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## Conflict of interest

The authors declare that there is no conflict of interest in the study.

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