



Article history:
Received 05 November 2025
Revised 28 February 2026
Accepted 04 March 2026
Published online 01 June 2026

Iranian Journal of Neurodevelopmental Disorders

Volume 5, Issue 2, pp 1-12



E-ISSN: 2980-9681

The Effectiveness of Metacognitive Therapy on Anxiety Sensitivity, Psychological Distress, and Pain Indicators in Female Students with Premenstrual Syndrome

Zahra. Solgi^{1*}, Alireza. Merati², Parisa. Yaseminejad³, Zahra. Naderinobandegani⁴

¹ Associate Professor, Department of Psychology, Payame Noor University, Tehran, Iran

² Assistant Professor, Department of Psychology, Payame Noor University, Tehran, Iran

³ Assistant Professor, Department of Psychology, Razi University, Kermanshah, Iran

⁴ Assistant Professor, Department of Psychology, Yazd University, Yazd, Iran

* Corresponding author email address: z_solgi@pnu.ac.ir

Article Info

Article type:

Original Research

How to cite this article:

Solgi, Z., Merati, A., Yaseminejad, P., & Naderinobandegani, Z. (2026). Comparing the Effectiveness of the Mindfulness-Based Stress Reduction Program and Cognitive-Behavioral Therapy on Pain Severity and Alexithymia in Women with Fibromyalgia. *Iranian Journal of Neurodevelopmental Disorders*, 5(2), 1-12.

<https://doi.org/10.61838/kman.jnnd.778>



© 2026 the authors. Published by Iranian Association for Intelligence and Talent Studies, Tehran, Iran. This is an open access article under the terms of the Creative Commons Attribution-NonCommercial 4.0 International (CC BY-NC 4.0) License.

ABSTRACT

Purpose: The present study aims to investigating the effectiveness of Metacognitive Therapy (MCT) on anxiety sensitivity, psychological distress, and pain indicators in individuals with PMS.

Methods and Materials: This semi-experimental study employed a pretest-posttest design with a control group and a two-month follow-up. The statistical population consisted of all female students diagnosed with PMS at Islamic Azad University of Kermanshah in 2024-2025. Thirty participants were selected using convenience sampling based on Fleiss's formula and randomly assigned to two equal groups. The experimental group received ten weekly sessions of Metacognitive Therapy, each lasting 90 minutes. Data collection tools included the Premenstrual Symptoms Screening Tool (Steiner et al.), the Depression Anxiety Stress Scales (DASS; Lovibond & Lovibond), the Anxiety Sensitivity Index (ASI; Floyd et al.), the McGill Pain Questionnaire, and the Pain Acceptance Questionnaire (McCracken et al.). Data were analyzed using descriptive statistics and repeated measures ANOVA in SPSS-26.

Findings: The findings revealed significant reductions in anxiety sensitivity ($F=17.75$, $p=0.005$, $\eta^2=0.61$), pain intensity ($F=6.18$, $p=0.009$, $\eta^2=0.54$), pain acceptance ($F=10.70$, $p=0.014$, $\eta^2=0.62$), and psychological distress ($F=43.45$, $p=0.001$, $\eta^2=0.60$) in the experimental group compared to the control group. These improvements were sustained at the two-month follow-up.

Conclusion: Metacognitive Therapy is effective in reducing pain indicators, anxiety sensitivity, and psychological distress in individuals with Premenstrual Syndrome. This treatment plan may be recommended as a beneficial therapeutic approach for trauma and pain clinics.

Keywords: Metacognitive Therapy, Anxiety Sensitivity, Psychological Distress, Pain, Menstruation.

1. Introduction

Premenstrual Syndrome (PMS) is one of the most prevalent health-related conditions among women of reproductive age and is characterized by a constellation of emotional, cognitive, behavioral, and physical symptoms that emerge during the luteal phase of the menstrual cycle and typically diminish shortly after the onset of menstruation. Although PMS is often considered a routine component of women's reproductive functioning, growing evidence indicates that its consequences extend far beyond temporary physical discomfort and significantly impair psychological functioning, academic performance, social interaction, sleep quality, emotional regulation, and overall quality of life (Hu et al., 2020; Kwon et al., 2022). The severity and persistence of symptoms differ across individuals, but for many women, PMS constitutes a chronic and distressing condition associated with heightened emotional vulnerability, increased pain sensitivity, and maladaptive cognitive processing (Mu et al., 2021; Pan et al., 2021). Recent epidemiological investigations suggest that dysmenorrhea and PMS affect a substantial proportion of adolescent girls and university students worldwide, with prevalence rates varying from moderate to extremely high across cultural settings (Azagew et al., 2020; Kim, 2021; Kim & Kim, 2021). In university populations, PMS has become an important public health concern because academic stress, irregular sleep patterns, nutritional habits, and psychosocial demands may intensify both physical pain and psychological distress (Kwon et al., 2022; Yu et al., 2024). Furthermore, women suffering from PMS frequently report reductions in concentration, increased irritability, emotional instability, and interpersonal conflict, all of which contribute to impaired psychosocial adaptation and emotional well-being (Caltekin et al., 2021; Kabukcu et al., 2021). These findings demonstrate that PMS is not merely a gynecological condition but rather a multidimensional biopsychological phenomenon requiring integrated therapeutic interventions that address both physical and psychological processes.

Among the psychological constructs strongly associated with PMS, anxiety sensitivity has received considerable empirical attention in recent years. Anxiety sensitivity refers to the tendency to fear anxiety-related sensations because of beliefs that these sensations may lead to catastrophic physical, cognitive, or social consequences (Paulus et al., 2021; Warren et al., 2021). Individuals with high anxiety sensitivity interpret ordinary bodily sensations as

threatening and dangerous, which amplifies emotional arousal and increases vulnerability to anxiety disorders, depression, pain catastrophizing, and stress-related dysfunction (Angehrn et al., 2020; Baradaran, 2020). In women with PMS, recurrent menstrual pain and hormonal fluctuations may intensify attention toward bodily sensations and reinforce maladaptive interpretations of physical symptoms, thereby increasing anxiety sensitivity and emotional distress (Mu et al., 2021; Quan et al., 2021). Research has consistently shown that heightened anxiety sensitivity is associated with greater emotional dysregulation, impaired coping abilities, and elevated psychological vulnerability across various clinical and non-clinical populations (Afshari & Hashemi, 2019; Paulus et al., 2021). Moreover, anxiety sensitivity has been linked to maladaptive metacognitive processes, including excessive worry, rumination, attentional bias toward threat, and catastrophic thinking (Seow et al., 2025; Yu et al., 2024). Contemporary metacognitive models propose that individuals who believe their thoughts and emotions are uncontrollable are more likely to engage in perseverative cognitive styles that maintain distress and intensify symptom perception (Bailey et al., 2025; Wells, 2025). This issue becomes particularly important in PMS because women often experience recurring anticipatory anxiety related to expected pain and emotional instability during premenstrual periods. Accordingly, anxiety sensitivity may function as a key psychological mechanism linking cognitive vulnerability to emotional suffering and pain amplification in individuals with PMS.

Another major psychological consequence associated with PMS is psychological distress, which encompasses symptoms of anxiety, depression, stress, irritability, emotional exhaustion, and cognitive dysfunction (Park et al., 2020; Satici et al., 2021). Psychological distress has been conceptualized as a generalized state of emotional suffering that negatively influences cognitive functioning, emotional regulation, social interaction, and behavioral adaptation. Women experiencing severe PMS symptoms frequently report elevated levels of depression, anxiety, sleep disturbances, hopelessness, and social withdrawal (Caltekin et al., 2021; Kim, 2021). Empirical findings indicate that the severity of menstrual symptoms is positively associated with emotional dysregulation and perceived stress levels, particularly among young women exposed to academic and interpersonal stressors (Hu et al., 2020; Kim & Kim, 2021). In addition, maladaptive coping strategies such as experiential avoidance, rumination, emotional suppression,



and catastrophic thinking have been identified as significant predictors of psychological distress among individuals experiencing chronic pain and menstrual discomfort (Requero et al., 2021; Shomali Ahmadabadi et al., 2021). Studies conducted during and after the COVID-19 pandemic also demonstrated that intolerance of uncertainty, fear-related cognitions, and maladaptive metacognitive beliefs substantially increase emotional distress and perceived vulnerability (Satici et al., 2021; Warren et al., 2021). From a cognitive perspective, distress is not solely produced by external stressors or physical pain but is significantly shaped by individuals' interpretations of internal experiences and their beliefs about the controllability of thoughts and emotions (Seow et al., 2025; Wells, 2025). Consequently, women with PMS who perceive their emotional experiences as threatening or uncontrollable may become trapped in cycles of worry, hypervigilance, and emotional overprocessing, thereby maintaining and intensifying psychological distress over time.

Pain-related indicators constitute another central dimension of PMS and include pain intensity, pain catastrophizing, pain acceptance, and emotional responses to pain. Menstrual pain has been associated with altered neural processing, heightened sensitivity to bodily sensations, and increased emotional reactivity (Mu et al., 2021; Quan et al., 2021). Studies have shown that women suffering from primary dysmenorrhea often exhibit lower pain thresholds and stronger affective responses to pain stimuli compared to women without menstrual pain (Pan et al., 2021; Vlachos & Lagattuta, 2021). Furthermore, chronic exposure to recurrent pain can contribute to maladaptive beliefs regarding bodily vulnerability and helplessness, which subsequently increase anxiety sensitivity and emotional dysregulation (Mannes et al., 2021; Ysidron et al., 2020). Pain acceptance has emerged as an important protective factor in this context and refers to the willingness to experience pain without excessive avoidance or attempts to control it (Ysidron et al., 2020). Greater pain acceptance has been associated with lower disability, reduced emotional distress, and improved psychological flexibility among individuals suffering from chronic pain conditions (Mannes et al., 2021; Rickardsson et al., 2021). Conversely, pain catastrophizing and emotional avoidance have been associated with increased pain intensity and poorer mental health outcomes (Vesal & Taher Neshatdoost, 2019; Yadavari et al., 2020). The psychological interpretation of pain therefore appears to play a critical role in determining individuals' emotional adjustment and functional outcomes. This understanding has

contributed to growing interest in psychological interventions capable of modifying maladaptive cognitive-emotional patterns associated with pain and distress.

In recent decades, metacognitive theory and Metacognitive Therapy (MCT) have emerged as influential approaches for understanding and treating emotional disorders. According to Wells' metacognitive model, psychological disorders are maintained not primarily by the content of thoughts but by dysfunctional beliefs about thinking itself and by maladaptive cognitive-attentional strategies collectively known as the Cognitive Attentional Syndrome (CAS) (Wells, 2025; Wells et al., 2021). CAS involves persistent worry, rumination, threat monitoring, attentional fixation, and maladaptive coping strategies that perpetuate emotional distress. MCT seeks to modify metacognitive beliefs and reduce engagement in maladaptive thinking processes rather than directly challenging the content of thoughts (Wells et al., 2021). Central techniques in MCT include detached mindfulness, attention training, worry postponement, and modification of beliefs concerning uncontrollability and danger of thoughts (Wells, 2025). Recent evidence indicates that MCT is effective in reducing symptoms of anxiety, depression, emotional dysregulation, and stress-related psychopathology across diverse clinical populations (Kennair et al., 2021; Wells et al., 2021). Furthermore, metacognitive interventions have shown promising effects in chronic pain populations by reducing pain catastrophizing and improving quality of life (Rickardsson et al., 2021; Yadavari et al., 2020). Research also suggests that maladaptive metacognitive beliefs are significantly associated with generalized anxiety symptoms, compulsivity, rumination, sleep disturbance, and emotional dysfunction (Bailey et al., 2025; Seow et al., 2025; Yu et al., 2024). These findings imply that metacognitive processes may represent an important therapeutic target for women suffering from PMS, particularly because recurrent pain and emotional fluctuations are often accompanied by repetitive negative thinking and maladaptive emotional monitoring.

Although previous investigations have examined the effectiveness of mindfulness-based interventions, cognitive-behavioral therapies, and acceptance-based approaches for pain management and emotional regulation (Farhangi, 2019; Rickardsson et al., 2021; Shabani & Khalatbari, 2019), relatively limited attention has been devoted to the role of metacognitive therapy in women with PMS. Existing studies indicate that maladaptive metacognitive beliefs contribute substantially to emotional suffering, pain amplification, and

impaired coping among individuals experiencing chronic stress and anxiety (Jafari & Shiralizadeh, 2021; Shahbahrami et al., 2021). Similarly, psychological flexibility and adaptive cognitive processing have been shown to improve emotional adjustment and reduce distress in clinical populations (Ali Akbari Dehkordi & Bitaneh, 2021; Fereydoni & Sabet, 2021). However, despite growing evidence regarding the relationship between metacognition, emotional dysregulation, and pain processing, research specifically investigating the effects of MCT on anxiety sensitivity, psychological distress, and pain indicators among women with PMS remains insufficient. Considering the multidimensional nature of PMS and the increasing recognition of cognitive-emotional mechanisms in pain perception, examining the efficacy of MCT may provide valuable theoretical and clinical insights. Moreover, non-pharmacological interventions are particularly important for young women who may avoid or inadequately respond to medical treatments for menstrual symptoms (Ferries-Rowe et al., 2020; Gardner & Rourke, 2021). Therefore, identifying effective psychological interventions capable of improving both emotional functioning and pain-related outcomes represents an important priority for mental health and women's health professionals. Accordingly, the present study aimed to investigate the effectiveness of Metacognitive Therapy on anxiety sensitivity, psychological distress, and pain indicators in female students with Premenstrual Syndrome.

2. Methods and Materials

2.1. Study Design and Participants

This study employed a quasi-experimental design with pretest-posttest and a control group, including a two-month follow-up period. The statistical population comprised all female students diagnosed with premenstrual syndrome (PMS) enrolled in the Faculty of Educational Sciences and Psychology at Islamic Azad University, Kermanshah Branch, in the year 2024-2025. A total of 30 participants were selected using a convenience sampling method.

Sample size was determined based on the type of research. In addition to using Fleiss's formula, G*Power software was utilized to calculate the required number of participants. According to the software, to achieve a statistical power of 0.90 with an effect size of 0.8 at a significance level of 0.05, a minimum of 15 participants per group was required (Faul et al., 2009). Therefore, the standard sample size was set at 15 participants in each group.

Based on Fleiss's formula, the following parameters were used: $\sigma = 1.61$ (the standard deviation of anxiety sensitivity in the posttest for the experimental group), $d^2 = 4.507$, power = 0.90, and $\alpha = 0.05$. In this formula, σ represents the standard deviation (i.e., the degree of dispersion), and d represents the confidence interval indicating the tolerable difference between the sample mean and the population mean. Based on the equation, the sample size was calculated to be 12.07. To ensure adequate power, 30 participants were selected for this study. They were randomly assigned to two equal groups of 15 using a simple randomization method (dice roll): odd numbers were allocated to the experimental group and even numbers to the control group.

Inclusion criteria were: being an unmarried female university student, providing informed consent to participate, having regular menstrual cycles, experiencing menstrual pain 4–5 days before menstruation in three or more consecutive cycles, and scoring 2 or 3 (moderate to severe pain) on the Verbal Multidimensional Pain Scale.

Exclusion criteria included: history of any pelvic or genital surgery, presence of conditions with symptoms similar to PMS (e.g., migraine, fibromyalgia, chronic fatigue syndrome, endometriosis, major depressive disorder, hormonal disorders), experience of recent grief or loss (e.g., death of a loved one or end of an emotional relationship) within the past six months, strict low-calorie diets, and missing more than one therapy session.

To ensure ethical standards, participants were provided with brief information about the study's purpose. They were assured that findings would be reported collectively and not individually, and they retained the right to withdraw at any stage. Written informed consent was obtained from all participants.

Participants in both groups completed the pretest questionnaires 7–10 days before the onset of their menstrual cycle. The experimental group received Metacognitive Therapy (MCT) in 10 weekly sessions, each lasting 90 minutes. During this period, the control group did not receive any form of psychological treatment. Posttest data were collected immediately after the final session, and a follow-up was conducted two months later using the same self-report questionnaires.

2.2. Measures

Premenstrual Symptoms Screening Tool (PSST): Developed by Steiner, MacDougall, and Brown (Steiner et al., 2003), this 19-item self-report questionnaire assesses

mood, physical, and behavioral symptoms related to the premenstrual period. It includes two subscales: symptom severity (items 1–14) and functional impairment (items 15–19). Responses are rated on a 4-point Likert scale (0 = not at all, 1 = mild, 2 = moderate, 3 = severe). Scores above 28 indicate the presence of premenstrual syndrome. In Iran, the tool demonstrated acceptable internal consistency (Cronbach's $\alpha = 0.90$) and content validity (0.70–0.80) (Saghebi Saeedi et al, 2018). In the current study, the reliability was $\alpha = 0.78$.

Anxiety Sensitivity Inventory (ASI): This 16-item scale developed by Floyd, Garfield, and LaSota (Floyd et al, 2005) measures anxiety sensitivity using a 5-point Likert scale ranging from 0 (very little) to 4 (very much). Each item reflects the belief that anxious emotions are experienced as unpleasant and have the potential to lead to harmful consequences. The degree of anxiety symptoms is indicated by higher scores. The score range is from 0 to 64. The scale includes three factors: fear of worries, fear of cognitive dyscontrol, and fear of publicly observable anxiety symptoms. Psychometric studies show high internal consistency ($\alpha = 0.80$ – 0.90), and test-retest reliability of 0.75 over two weeks and 0.71 over three years which indicates that anxiety sensitivity is a stable personality construct. In Iranian samples, the scale demonstrated high reliability ($\alpha = 0.93, 0.95, \text{ and } 0.97$ for internal consistency, test-retest, and split-half methods respectively) (Afshari & Hashemi, 2019). The correlations between the sub-scales have also been reported to range from 0.40 to 0.68. In this study, Cronbach's α was 0.75.

Depression Anxiety Stress Scales (DASS-21): Designed by Lovibond & Lovibond (1995), this 21-item instrument measures psychological distress across three subscales: depression, anxiety, and stress. Participants report the extent to which they experienced each symptom over the past week using a 4-point Likert scale (0 = not at all to 3 = very much). The classification of depression scores is as follows: normal (0–9), mild (10–13), moderate (14–20), severe (21–27), and extremely severe (28 and above). The classification of anxiety scores is: normal (0–7), mild (8–9), moderate (10–14), severe (15–19), and extremely severe (20 and above). The classification of stress scores is: normal (0–14), mild (15–18), moderate (19–25), severe (26–33), and extremely severe (34 and above). Items 1, 6, 8, 11, 12, 14, and 18 assess stress; items 2, 4, 7, 9, 15, 19, and 20 assess anxiety; and items 3, 5, 10, 13, 16, 17, and 21 assess depression. In international studies, internal consistency has been reported at $\alpha = 0.88$ (Park & Song, 2020). In Iran, Cronbach's α

values for the subscales were 0.79 (stress), 0.80 (anxiety), and 0.81 (depression), with an overall α of 0.91 (Tehrani et al, 2018). In this study, α coefficients were 0.75 (stress), 0.78 (anxiety), and 0.78 (depression).

McGill Pain Questionnaire (MPQ): The MPQ (McGill, 2008) is one of the most comprehensive tools for assessing the qualitative and quantitative dimensions of pain. It consists of 20 sets of descriptors covering four domains: sensory (sets 1–10), affective (sets 11–15), evaluative (sets 16–17), and miscellaneous (sets 18–20). Higher scores indicate greater pain intensity. McGill (2008) reported a reliability and validity Cronbach's α of 0.87. In Iranian research, the α coefficient was 0.84 (Jafari & Shiralizadeh, 2021). In the present study, the MPQ demonstrated a Cronbach's α of 0.81.

Chronic Pain Acceptance Questionnaire: Developed by McCracken, Vowles, and Eccleston (McCracken et al, 2004), this questionnaire has been widely used in studies related to chronic pain. It consists of 20 items, each rated on a 5-point Likert scale ranging from never (1 point) to always (5 points). The Chronic Pain Acceptance Questionnaire includes two subscales: a) Activity Engagement – referring to the pursuit of daily activities despite pain, and b) Pain Willingness – indicating a relative absence of attempts to avoid or control pain. The Cronbach's α coefficients for the two subscales have been reported as 0.79 and 0.75, respectively. In a pilot study, the internal consistency of the questionnaire was found to be 0.74 using Cronbach's α . In the present study, the reliability coefficient (Cronbach's α) was also found to be 0.74.

2.3. Interventions

The Metacognitive Therapy (MCT) protocol used in the present study was based on Wells' metacognitive intervention model and was implemented across ten weekly 90-minute group sessions. The first and second sessions focused on introducing participants to the therapeutic framework, conceptualizing the nature of Premenstrual Syndrome-related emotional distress and pain experiences, developing metacognitive awareness, preparing participants for treatment, and conducting thought suppression experiments to demonstrate the paradoxical effects of cognitive control attempts. In the third session, individualized case formulations were developed, the metacognitive model was further explained, detached mindfulness techniques were introduced, dysfunctional beliefs concerning uncontrollability of thoughts were

challenged, worry postponement strategies were taught, and related homework assignments were provided. During the fourth session, participants reviewed previous homework assignments and engaged in verbal and behavioral reattribution exercises targeting maladaptive beliefs regarding uncontrollability and emotional vulnerability. The fifth session emphasized continued modification of uncontrollability beliefs through disconfirmatory evidence, psychoeducation regarding chronic pain and menstrual symptoms, training in adaptive coping strategies for pain management, implementation of loss-of-control experiments, and identification and interruption of maladaptive avoidance and control behaviors. In the sixth and seventh sessions, therapeutic focus shifted toward challenging automatic beliefs related to anxiety sensitivity, stressors, and pain-related cognitions, while participants engaged in behavioral experiments examining fears of losing control or experiencing emotional harm due to anxiety and worry; participants also received training in coping with anxiety-provoking thoughts and emotional reactions associated with menstrual pain. The eighth and ninth sessions concentrated on continued restructuring of anxious beliefs, reversal of remaining maladaptive coping strategies, development and modification of positive metacognitive beliefs, and application of mindfulness and acceptance techniques for managing pain-related experiences and emotional distress. Finally, the tenth session involved summarizing therapeutic progress, developing individualized relapse-prevention plans for anxiety sensitivity and psychological distress, strengthening alternative coping responses, providing practical guidance for managing chronic pain-related emotions and negative thoughts, preparing participants for termination of therapy, and administering the posttest assessment.

2.4. Data Analysis

The research procedure was as follows: First, a public announcement invited female university students who had

menstrual pain to participate in the study. As a result of this announcement, 96 students visited the counseling center at Islamic Azad University, Kermanshah Branch. These individuals were assessed and interviewed by a specialist in psychology to identify symptoms of premenstrual syndrome (PMS). They were also asked to complete the Premenstrual Symptoms Screening Questionnaire (PSSQ) during the 7 to 10 days prior to the onset of their menstrual period.

Based on the clinical interviews and their scores on the self-report screening tool, 62 individuals were identified as likely meeting the criteria for PMS. Given the potential for response bias in self-report measures, all candidates were immediately referred to a gynecologist (who had been previously coordinated with) for diagnostic confirmation. Following this medical evaluation, 44 individuals received a definitive diagnosis of PMS.

Among these 44 individuals, 30 who were willing to participate were selected through convenience sampling and then randomly assigned into two equal groups: an experimental group ($n = 15$) and a control group ($n = 15$).

Data were analyzed using SPSS software version 26. Statistical tests included the Kolmogorov–Smirnov test, Box’s M test, Mauchly’s test of sphericity, Levene’s test, and two-way repeated measures ANOVA.

3. Findings and Results

It is noteworthy that none of the participants withdrew from the study during the intervention phase. Demographic data showed that the mean age in the experimental group was 28.09 years ($SD = 6.07$), while in the control group it was 28.14 years ($SD = 5.83$). There were no statistically significant differences between the groups in terms of educational level, socioeconomic status, or duration of menstrual pain symptoms (7 to 10 days prior to onset of menstruation, based on questionnaire responses and gynecologist assessment) ($p > 0.05$).

Table 1

Descriptive Data of Research Variables by Group and Assessment Stages

Variable	Group (n = 15)	Pre-test Mean \pm SD	Post-test Mean \pm SD	Follow-up Mean \pm SD
Pain Intensity	Experimental	15.00 \pm 0.90	12.87 \pm 0.84	12.80 \pm 1.01
	Control	14.85 \pm 1.34	14.93 \pm 1.41	14.96 \pm 1.44
Pain Acceptance	Experimental	18.19 \pm 3.64	12.00 \pm 1.77	12.04 \pm 1.51
	Control	19.13 \pm 2.59	19.47 \pm 3.11	19.43 \pm 3.10
Anxiety Sensitivity	Experimental	29.08 \pm 5.34	21.62 \pm 3.37	21.40 \pm 3.60
	Control	28.60 \pm 4.12	28.77 \pm 4.44	28.70 \pm 4.31

Depression	Experimental	16.43 ± 4.59	11.76 ± 2.20	11.70 ± 2.18
	Control	17.10 ± 3.54	17.23 ± 2.56	17.21 ± 2.55
Anxiety	Experimental	19.00 ± 3.08	14.27 ± 2.12	14.21 ± 2.08
	Control	18.33 ± 3.14	18.29 ± 3.12	18.31 ± 3.17
Stress	Experimental	14.58 ± 2.36	10.33 ± 0.89	10.27 ± 0.93
	Control	14.47 ± 2.23	14.53 ± 2.36	14.62 ± 2.40
Psychological Distress	Experimental	15.01 ± 10.03	36.36 ± 5.21	36.18 ± 5.19
	Control	49.09 ± 8.91	50.05 ± 8.04	50.14 ± 8.12

Table 1 presents the means and standard deviations of the psychological constructs (i.e., anxiety sensitivity and psychological distress) and pain-related indices (i.e., pain acceptance and pain intensity) for the research groups across different assessment stages. The results indicate that, compared to the control group, the mean scores of anxiety sensitivity, psychological distress, and each of its components decreased in the experimental group during the post-test and follow-up phases. Moreover, the findings revealed improvements in the mean scores of pain intensity and pain acceptance in the experimental group during the same phases. To test the assumptions of the repeated measures two-way ANOVA, the Kolmogorov–Smirnov test indicated that the assumption of normality was met, as the calculated z-values were not statistically significant at the 0.05 level ($p > 0.05$). In the Box’s M test, the F-values for anxiety sensitivity ($F = 1.404, p = 0.319$), depression ($F = 0.689, p = 0.241$), anxiety ($F = 1.376, p = 0.351$), stress ($F =$

$1.903, p = 0.601$), pain intensity ($F = 23.222, p = 0.277$), and pain acceptance ($F = 0.865, p = 0.399$) were not statistically significant, confirming the assumption of homogeneity of variance covariance matrices. Levene’s test results for equality of error variances across pre-test, post-test, and follow-up stages showed that the F-values were also not significant at the 0.05 level. Thus, the assumption of equal error variances across time points was satisfied. To examine the assumption of sphericity, Mauchly’s test was used. The results indicated that this assumption was violated for pain intensity and depression. Therefore, due to the violation of sphericity, the Greenhouse–Geisser correction—which is more conservative than the other available corrections—was applied when interpreting within-subject effects. In summary, all necessary statistical assumptions for conducting repeated measures two-way ANOVA were met, and the Greenhouse–Geisser correction was employed where appropriate.

Table 2

Results of Repeated Measures Analysis of Variance of Research Variables in Three Stages of Implementation

Research Variable	Source of Variation	F Statistic	Significance Level (p)	Effect Size (Partial η^2)
Pain Intensity	Group	5.94	0.022	0.43
	Time	10.47	0.016	0.48
	Group × Time	6.18	0.009	0.54
Pain Acceptance	Group	9.13	0.003	0.60
	Time	5.16	0.007	0.57
	Group × Time	10.70	0.014	0.62
Anxiety Sensitivity	Group	6.00	0.011	0.64
	Time	21.73	0.019	0.71
	Group × Time	17.75	0.005	0.61
Depression	Group	4.569	0.001	0.580
	Time	2.234	0.001	0.613
	Group × Time	10.339	0.001	0.674
Anxiety	Group	9.318	0.001	0.692
	Time	12.791	0.001	0.620
	Group × Time	15.238	0.001	0.633
Stress	Group	3.850	0.001	0.560
	Time	8.765	0.001	0.614
	Group × Time	20.598	0.001	0.619
Psychological Distress	Group	31.108	0.001	0.526
	Time	91.633	0.001	0.766
	Group × Time	43.456	0.001	0.608

Note: All results are based on the Greenhouse–Geisser correction. Significance threshold: $p < 0.05$.

Table 2 shows that for the total score of anxiety sensitivity, pain indices, psychological distress, and each of its components (depression, anxiety, and stress), all three effects—between-group, within-group, and the interaction of group \times time—were statistically significant. Comparison of means indicates that in both post-test and follow-up stages, the intervention groups achieved better scores on the dependent variables under study. The effect sizes were as follows: total anxiety sensitivity (0.61), pain intensity (0.54), pain acceptance (0.62), psychological distress (0.60), and its components: depression (0.67), anxiety (0.63), and stress (0.61). The effect of metacognitive therapy on the dependent variables remained stable after a two-month follow-up ($P < 0.05$). Overall, the findings indicate that metacognitive therapy was effective (beneficial) in improving the studied variables.

4. Discussion and Conclusion

The findings of the present study demonstrated that Metacognitive Therapy (MCT) was significantly effective in reducing anxiety sensitivity, psychological distress, and pain-related indicators among female students with Premenstrual Syndrome (PMS), and these therapeutic effects remained stable during the follow-up period. Specifically, the results showed that participants in the experimental group experienced meaningful reductions in anxiety sensitivity, depression, anxiety, stress, and pain intensity, alongside improvements in pain acceptance, compared with the control group. The effect sizes obtained for the interaction between time and group across most dependent variables indicated that MCT produced substantial and clinically meaningful changes in emotional and cognitive functioning. These findings support the central assumptions of metacognitive theory, which posit that maladaptive emotional responses are maintained by dysfunctional metacognitive beliefs and repetitive negative thinking styles rather than by the mere presence of unpleasant internal experiences (Wells, 2025; Wells et al., 2021). Women with PMS often experience persistent worry regarding pain, emotional instability, and anticipated menstrual symptoms, and these concerns may trigger heightened self-focused attention and catastrophic interpretations of bodily sensations. By targeting maladaptive metacognitive processes such as rumination, worry, attentional fixation, and beliefs about uncontrollability of thoughts, MCT appears to reduce the

cognitive-emotional mechanisms that sustain distress and pain amplification in this population.

One of the major findings of the study was the significant reduction in anxiety sensitivity following MCT intervention. This result is consistent with previous studies emphasizing the important role of anxiety sensitivity in emotional disorders and psychosomatic distress (Paulus et al., 2021; Warren et al., 2021). Anxiety sensitivity refers to the tendency to interpret anxiety-related sensations as dangerous, harmful, or uncontrollable, thereby increasing emotional arousal and physiological hypervigilance (Angehrn et al., 2020). Women with PMS often become excessively attentive to bodily sensations and hormonal fluctuations, interpreting these experiences catastrophically and thereby increasing emotional distress and pain sensitivity. The present findings are aligned with the results of Afshari and Hashemi, who reported a strong association between anxiety sensitivity, maladaptive metacognitive beliefs, and emotional dysfunction among students (Afshari & Hashemi, 2019). Similarly, studies conducted by Baradaran demonstrated that maladaptive emotion regulation strategies and perfectionistic cognitive styles significantly predict anxiety sensitivity (Baradaran, 2020). Furthermore, Warren and colleagues found that individuals with elevated anxiety sensitivity are more vulnerable to fear-related cognitions and psychological dysfunction under stressful conditions (Warren et al., 2021). From the perspective of metacognitive theory, individuals with high anxiety sensitivity tend to perceive intrusive thoughts and physiological sensations as threatening, which increases cognitive monitoring and emotional dysregulation (Wells, 2025). MCT techniques such as detached mindfulness and attention training likely helped participants disengage from maladaptive monitoring of bodily symptoms and reinterpret anxious thoughts without catastrophizing them. Consequently, participants gradually developed greater psychological distance from distressing cognitions and reduced emotional reactivity toward menstrual symptoms.

The findings also indicated significant reductions in depression, anxiety, stress, and overall psychological distress among participants who received MCT. These results are consistent with prior research emphasizing the effectiveness of metacognitive interventions in reducing emotional dysfunction across clinical populations (Kennair et al., 2021; Wells et al., 2021). PMS is frequently accompanied by emotional instability, irritability, depressive symptoms, and elevated stress levels due to hormonal fluctuations and maladaptive cognitive processing (Caltekin

et al., 2021; Kim, 2021). Individuals experiencing PMS often engage in repetitive negative thinking patterns, including rumination and anticipatory worry, which intensify emotional exhaustion and psychological suffering. The current findings correspond with studies conducted by Satici and colleagues, who found that maladaptive cognitive-emotional processes strongly predict psychological distress and reduced life satisfaction (Satici et al., 2021). Likewise, Shomali Ahmadabadi and colleagues reported that experiential avoidance and maladaptive cognitive responses are associated with increased anxiety and emotional dysfunction (Shomali Ahmadabadi et al., 2021). In addition, research by Bailey and colleagues demonstrated that dysfunctional metacognitive beliefs significantly contribute to generalized anxiety symptoms and emotional instability (Bailey et al., 2025). From a theoretical standpoint, MCT reduces distress by interrupting the Cognitive Attentional Syndrome, which consists of worry, rumination, attentional fixation on threat, and maladaptive coping strategies (Wells, 2025). By teaching individuals that thoughts are transient mental events rather than objective threats requiring continuous engagement, MCT promotes emotional flexibility and adaptive self-regulation. Participants likely learned to reduce cognitive overengagement with pain-related concerns and emotional fluctuations, which subsequently lowered depressive and anxious symptoms.

Another important finding of this study was the significant improvement in pain-related indicators, particularly reduced pain intensity and enhanced pain acceptance. These results are consistent with previous investigations highlighting the role of psychological processes in the perception and management of chronic pain (Vesal & Taher Neshatdoost, 2019; Yadavari et al., 2020). Research suggests that pain is not solely a sensory experience but is substantially influenced by emotional interpretation, attentional focus, cognitive appraisal, and metacognitive beliefs (Mu et al., 2021; Quan et al., 2021). Women with PMS who catastrophize pain or interpret bodily sensations as intolerable often experience intensified physical discomfort and emotional suffering. The reduction in pain intensity observed in the present study may therefore be explained by decreased attentional fixation on pain sensations and reduced catastrophic interpretation of bodily symptoms. The findings align with those of Ysidron and colleagues, who emphasized the protective role of pain acceptance in reducing emotional distress and improving adjustment among individuals with chronic pain (Ysidron et al., 2020). Similarly, Rickardsson and colleagues

demonstrated that psychological interventions emphasizing acceptance and cognitive flexibility improve long-term pain outcomes (Rickardsson et al., 2021). Studies by Mannes and colleagues also showed that greater pain acceptance is associated with reduced emotional impairment and improved psychological adaptation (Mannes et al., 2021). Within MCT, participants are encouraged not to suppress or control painful experiences excessively but rather to disengage from maladaptive cognitive responses to pain. Detached mindfulness may have enabled participants to experience menstrual discomfort without escalating emotional reactions through worry and catastrophizing. As a result, participants likely developed greater tolerance toward unpleasant bodily sensations and became less emotionally overwhelmed by pain experiences.

The observed improvements in psychological functioning may additionally be understood through the relationship between metacognition, rumination, and sleep disturbance. Previous studies indicate that maladaptive metacognitive beliefs contribute to repetitive negative thinking, impaired sleep quality, and emotional exhaustion among individuals vulnerable to anxiety disorders (Seow et al., 2025; Yu et al., 2024). PMS-related discomfort is often associated with sleep disruption and persistent cognitive preoccupation with symptoms, which can intensify emotional instability and physical fatigue. MCT directly addresses these dysfunctional cognitive cycles by reducing beliefs regarding the uncontrollability and danger of thoughts. The findings of Seow and colleagues further demonstrated that metacognitive biases contribute to maladaptive information processing across both perception and memory systems (Seow et al., 2025). Therefore, reductions in distress and anxiety sensitivity among participants may have resulted from changes in how internal experiences were interpreted and cognitively processed. Moreover, the intervention likely increased participants' sense of cognitive control and emotional efficacy, thereby reducing helplessness and enhancing adaptive coping responses during premenstrual periods.

The effectiveness of MCT in the present study may also be interpreted within broader cognitive-behavioral and emotional regulation frameworks. Studies on mindfulness-based and acceptance-based interventions indicate that psychological flexibility and reduced experiential avoidance contribute significantly to emotional well-being and pain management (Farhangi, 2019; Shabani & Khalatbari, 2019). Although MCT differs conceptually from mindfulness-based therapies, both approaches emphasize changing

individuals' relationships with internal experiences rather than attempting to eliminate distressing thoughts entirely. In the present study, participants were trained to observe thoughts without reacting automatically to them, postpone worry, and disengage from maladaptive monitoring of symptoms. Such processes likely weakened negative metacognitive beliefs and reduced cognitive-emotional escalation during painful or emotionally challenging experiences. Furthermore, studies conducted among individuals with chronic illness and emotional disorders have shown that interventions targeting cognitive flexibility and adaptive coping improve emotional adjustment and resilience (Ali Akbari Dehkordi & Bitaneh, 2021; Fereydoni & Sabet, 2021). The sustained improvements observed during follow-up suggest that participants internalized these cognitive-emotional skills and continued applying them after the intervention ended.

Overall, the findings of the present study support the growing body of literature emphasizing the importance of metacognitive processes in emotional disorders, pain perception, and psychological adaptation. Women with PMS often experience cyclical emotional and physical suffering that is exacerbated by maladaptive cognitive styles, anxiety sensitivity, and repetitive negative thinking. By directly targeting dysfunctional metacognitive beliefs and reducing cognitive-attentional fixation on symptoms, MCT appears capable of improving both emotional and pain-related outcomes in this population. The sustained therapeutic gains observed during follow-up further indicate that MCT may contribute to long-term psychological resilience and adaptive coping. Considering the multidimensional nature of PMS and the limitations associated with pharmacological approaches, integrating metacognitive interventions into psychological and healthcare services for women may provide an effective and accessible method for reducing distress and improving quality of life.

One limitation of the present study was the relatively small sample size, which may restrict the generalizability of the findings to broader populations of women with Premenstrual Syndrome. Additionally, participants were selected from a single university population, and therefore the findings may not fully represent women from different cultural, educational, or socioeconomic backgrounds. Another limitation relates to the use of self-report instruments, which may be influenced by response biases and subjective interpretations. Furthermore, the follow-up period was limited to two months, preventing assessment of

the long-term durability of treatment effects over extended periods.

Future research should investigate the effectiveness of Metacognitive Therapy in more diverse populations, including adolescent girls, married women, and clinical populations with severe menstrual disorders. Comparative studies examining the relative efficacy of MCT against other interventions such as cognitive-behavioral therapy, acceptance and commitment therapy, and mindfulness-based interventions would also provide valuable clinical insights. Future investigations may additionally explore mediating variables such as rumination, sleep quality, emotion regulation, body awareness, and cognitive flexibility in order to clarify the mechanisms underlying therapeutic change. Longitudinal studies with larger sample sizes and longer follow-up periods are recommended to determine the long-term stability of treatment outcomes.

The findings of this study have important practical implications for psychologists, counselors, gynecologists, and healthcare professionals working with women experiencing Premenstrual Syndrome. Metacognitive Therapy may serve as an effective non-pharmacological intervention for reducing emotional distress and pain-related symptoms in women reluctant to rely on medication-based treatments. University counseling centers and women's mental health clinics can incorporate metacognitive interventions into their therapeutic programs to improve emotional well-being and adaptive coping among female students. In addition, educational workshops focused on metacognitive awareness, emotional self-regulation, and adaptive coping strategies may contribute to greater psychological resilience and improved quality of life among women experiencing menstrual-related difficulties.

Authors' Contributions

All authors significantly contributed to this study.

Declaration

In order to correct and improve the academic writing of our paper, we have used the language model ChatGPT.

Transparency Statement

Data are available for research purposes upon reasonable request to the corresponding author.

Acknowledgments

We hereby thank all individuals for participating and cooperating us in this study.

Declaration of Interest

The authors report no conflict of interest.

Funding

According to the authors, this article has no financial support.

Ethical Considerations

In this study, to observe ethical considerations, participants were informed about the goals and importance of the research before the start of the study and participated in the research with informed consent.

References

- Afshari, A., & Hashemi, Z. (2019). The relationship between anxiety sensitivity and metacognitive beliefs and test anxiety among students. *Journal of School Psychology, 8*(1), 7-25.
- Ali Akbari Dehkordi, M., & Bitaneh, M. (2021). The Effectiveness of Psychological Capital Elements Training on Psychological Flexibility and Psychological Distress on the Women with Breast Cancer. *QUARTERLY JOURNAL OF HEALTH PSYCHOLOGY, 10*(38), 7-22.
- Angehrn, A., Krakauer, R. L., & Carleton, R. N. (2020). The impact of intolerance of uncertainty and anxiety sensitivity on mental health among public safety personnel: When the uncertain is unavoidable. *Cognitive therapy and research, 44*(5), 919-930.
- Azagew, A. W., Kassie, D. G., & Walle, T. A. (2020). Prevalence of primary dysmenorrhea, its intensity, impact and associated factors among female students at Gondar town preparatory school, Northwest Ethiopia. *BMC Women's Health, 20*(1), 1-7.
- Bailey, R., Oba, E. C., & Allen, R. (2025). The Role of Metacognitive Beliefs in Generalized Anxiety Disorder in Men Who Have Sex with Men Living with HIV in Nigeria. *Journal of Health Psychology*. <https://doi.org/10.1177/13591053251314989>
- Baradaran, M. (2020). The Mediating Role of Cognitive Emotion Regulation Strategies and Defense Mechanisms in the Relationship between Perfectionism and Anxiety Sensitivity in Cosmetic Surgery Applicants Students. *QUARTERLY JOURNAL OF HEALTH PSYCHOLOGY, 9*(34), 57-74.
- Caltekin, I., Hamamci, M., Demir Caltekin, M., & Onat, T. (2021). Evaluation of sleep disorders, anxiety and depression in women with dysmenorrhea. *Sleep and Biological Rhythms, 19*(1), 13-21.
- Farhangi, A. (2019). Effectiveness of Mindfulness Based Cognitive Therapy Chronic Pain Management on Psycho-Social Function in Women with Breast Cancer. *Journal of Excellence in counseling and psychotherapy, 8*(2), 11-28.
- Fereydoni, F., & Sabet, M. (2021). The Effect of Solution-Focused Brief Psychotherapy on Distress Tolerance, Decision-Making Styles and Social Adjustment in MS Patients of Sari City. *Journal of Consulting Excellence and Psychotherapy, 10*, 36-47.
- Ferries-Rowe, E., Corey, E., & Archer, J. S. (2020). Primary dysmenorrhea: Diagnosis and therapy. *Obstetrics and Gynecology, 136*(5), 1047-1058.
- Gardner, B. R., & Rourke, N. L. (2021). Multimodal analgesia in a Southern White Rhinoceros with pentosan polysulfate, gabapentin, amantadine and phenylbutazone to manage chronic pain. *Australian Veterinary Journal, 99*(3), 86-88.
- Hu, Z., Tang, L., Chen, L., Kaminga, A. C., & Xu, H. (2020). Prevalence and risk factors associated with primary dysmenorrhea among Chinese female university students: A cross-sectional study. *Journal of Pediatric and Adolescent Gynecology, 33*(1), 15-22.
- Jafari, A., & Shiralizadeh, S. (2021). The Predicting of Pain Based on Emotional Expression in Women with Breast Cancer in Pandemic COVID-19: Mediating Role of Life Style. *IJCA, 2*(2), 13-23.
- Kabukcu, C., Basay, B. K., & Basay, O. (2021). Primary dysmenorrhea in adolescents: Association with attention deficit hyperactivity disorder and psychological symptoms. *Taiwanese Journal of Obstetrics and Gynecology, 60*(2), 311-317.
- Kennair, L. E., Solem, S., Hagen, R., Havnen, A., Nysaeter, T. E., & Hjemdal, O. (2021). Change in personality traits and facets following metacognitive therapy or cognitive behaviour therapy for generalized anxiety disorder. *Clinical Psychology and Psychotherapy, 28*(4), 872-881.
- Kim, H. S. (2021). Factors Affecting Perceived Stress, Depression and Sleep Disturbance on the Dysmenorrhea among Female University Students. *Journal of the Korean Applied Science and Technology, 38*(2), 399-410.
- Kim, S. S., & Kim, H. S. (2021). Dysmenorrhea in High School Girls and Its Influencing Factors. *Journal of the Korea convergence society, 12*(3), 409-420.
- Kwon, Y. J., Sung, D. I., & Lee, J. W. (2022). Association among Premenstrual Syndrome, Dietary Patterns, and Adherence to Mediterranean Diet. *Nutrients, 14*(12), 2-11.
- Mannes, Z. L., Ferguson, E. G., Ennis, N., Hasin, D. S., & Cottler, L. B. (2021). Pain Acceptance Among Retired National Football League Athletes: Implications for Clinical Intervention. *Journal of Clinical Sport Psychology, 1*(1), 1-4.
- Mu, J., Wang, Q., Dun, W., Yang, J., Wang, K., & Zhang, M. (2021). The effects of long-term menstrual pain on pain empathy in women with primary dysmenorrhea. *Journal of Pain, 162*(7), 2051-2059.
- Pan, Y. Y., Jin, S. H., Luo, S., Li, R. R., Tu, Y. Y., & Jin, D. (2021). Dysmenorrhea is associated with a higher incidence of pain after diagnostic hysteroscopy or treatment. *Signa Vitae, 17*(2), 63-66.
- Park, S. H., Song, Y. J., Demetriou, E. A., Pepper, K. L., Thomas, E. E., & Hickie, I. B. (2020). Validation of the 21-item Depression, Anxiety, and Stress Scales in individuals with autism spectrum disorder. *Psychiatry research, 291*, 113300.
- Paulus, D. J., Capron, D. W., & Zvolensky, M. J. (2021). Understanding hazardous drinking and suicidal ideation and suicide risk among college students: Anxiety sensitivity as an explanatory factor. *Cognitive behaviour therapy, 50*(5), 378-394.
- Quan, S., Yang, J., Dun, W., Wang, K., Liu, H., & Liu, J. (2021). Prediction of pain intensity with uterine morphological features and brain microstructural and functional properties in women with primary dysmenorrhea. *Brain Imaging and Behavior, 15*(3), 1580-1588.
- Requero, B., Brinol, P., & Petty, R. E. (2021). The impact of hope and hopelessness on evaluation: A meta-cognitive approach. *European Journal of Social Psychology, 51*(2), 222-238.



- Rickardsson, J., Gentili, C., Holmstrom, L., Zetterqvist, V., Andersson, E., & Persson, J. (2021). Internet-delivered acceptance and commitment therapy as microlearning for chronic pain: A randomized controlled trial with 1-year follow-up. *European Journal of Pain*, 25(5), 1012-1030.
- Satici, B., Gocet-Tekin, E., Deniz, M., & Satici, S. A. (2021). Adaptation of the Fear of COVID-19 Scale: Its association with psychological distress and life satisfaction in Turkey. *International journal of mental health and addiction*, 19(6), 1980-1988.
- Seow, T. X., Fleming, S. J., & Hauser, T. U. (2025). Metacognitive Biases in Anxiety-Depression and Compulsivity Extend Across Perception and Memory. *PLOS Ment Health*, 2(3), e0000259. <https://doi.org/10.1371/journal.pmen.0000259>
- Shabani, M., & Khalatbari, J. (2019). The effectiveness of mindfulness-based stress reduction training on emotion regulation difficulties and psychological well-being in premenstrual syndrome. *Health Psychology*, 8(1), 134-152.
- Shahbahrami, M., Mohammadkhani, S., & Akbari, M. (2021). The Diagnostic Role of Distress Tolerance, Metacognition, Sensation Seeking, and Perceived Social Disorganization in Methamphetamine, Opium, and Alcohol Users. *Addiction Research*, 15(60), 325-350.
- Shomali Ahmadabadi, M., Poorjanebolahi, M., Behjat, A., & Barkhordari Ahmadabadi, A. (2021). The Role of Experiential Avoidance and Professional Assistance Orientation in Predicting COVID-19 Anxiety. *Journal of Consulting Excellence and Psychotherapy*, 9(36), 67-78.
- Vesal, M., & Taher Neshatdoost, H. (2019). Meta-analysis of psychological intervention's effectiveness on reduction of pain intensity among patients with chronic pain. *Journal of Applied Psychology*, 10(3), 21-38.
- Vlachos, D., & Lagattuta, C. (2021). Is osteopathic manipulative treatment effective in reducing primary dysmenorrhea? *Evidence-Based Practice*, 24(8), 43-44.
- Warren, A. M., Zolfaghari, K., Fresnedo, M., Bennett, M., Pogue, J., & Waddimba, A. (2021). Anxiety sensitivity, COVID-19 fear, and mental health: Results from a United States population sample. *Cognitive behaviour therapy*, 50(3), 204-216.
- Wells, A. (2025). *Metacognitive therapy for anxiety and depression*. Arjmand. <https://drmohammadkhani.com/>
- Wells, A., Reeves, D., Capobianco, L., Heal, C., Davies, L., & Heagerty, A. (2021). Improving the Effectiveness of Psychological Interventions for Depression and Anxiety in Cardiac Rehabilitation: PATHWAY-A Single-Blind, Parallel, Randomized, Controlled Trial of Group Metacognitive Therapy. *Circulation*, 144(1), 23-33.
- Yadavari, M., Naderi, F., Makvandi, B., & Hafezi, F. (2020). The Effects of Metacognitive Therapy on Pain Catastrophizing and Quality of Life in Patients with Chronic Pain. *Middle Eastern Journal of Disability Studies*---, 10, 134-135.
- Ysidron, D. W., Slepian, P. M., Ankawi, B., Himawan, L. K., & France, C. R. (2020). Pain Acceptance Partially Mediates the Relationship Between Perceived Injustice and Pain Outcomes Over 3 Months. *The Clinical Journal of Pain*, 36(11), 868-873.
- Yu, H., Shi, Z., & Zhao, M. (2024). The Relationship between Metacognition, Rumination, and Sleep in University Students with a Tendency toward Generalized Anxiety Disorder. *Behavioral Sciences*, 14(6), 444. <https://doi.org/10.3390/bs14060444>