Journal Website

Article history:
Received 23 December 2025
Revised 18 April 2026
Accepted 25 April 2026
Published online 01 October 2026

Iranian Journal of Neurodevelopmental Disorders

Volume 5, Issue 4, pp 1-11

E-ISSN: 2980-9681

Comparing the Effectiveness of the Mindfulness-Based Stress Reduction Program and Cognitive-Behavioral Therapy on Pain Severity and Alexithymia in Women with Fibromyalgia

Rezvaneh. Aziminia[1], Mehran. Azadi[2*], Mastooreh. Sedaghat[2]

[1] Department of Psychology, Ki.C., Islamic Azad University, Kish, Iran
[2] Department of Psychology, ST.C., Islamic Azad University, Tehran, Iran

*** Corresponding author email address**: M_azadi@azad.ac.ir

A r t i c l e I n f o

Article type:
Original Research

How to cite this article:
Aziminia, R., Azadi, M., & Sedaghat, M. (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*(4), 1-11.
https://doi.org/10.61838/kman.jndd.781

© 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.

A B S T R A C T

Purpose: The present study aimed to compare the effectiveness of the Mindfulness-Based Stress Reduction (MBSR) program and Cognitive-Behavioral Therapy (CBT) on pain severity and alexithymia in women diagnosed with fibromyalgia.

Methods and Materials: This study employed a quasi-experimental design with a pretest–posttest and follow-up structure including a control group. The statistical population consisted of women diagnosed with fibromyalgia who attended the rheumatology clinic of Sina Hospital in Tehran between August and October 2025. From this population, 45 participants were selected through purposive sampling and randomly assigned to three groups: Mindfulness-Based Stress Reduction (n = 15), Cognitive-Behavioral Therapy (n = 15), and control (n = 15). The experimental groups received eight weekly intervention sessions, while the control group received no intervention. Data collection instruments included the McGill Pain Questionnaire and the Toronto Alexithymia Scale (TAS-20). Data were analyzed using multivariate analysis of variance (MANOVA) and Bonferroni post hoc tests in IBM SPSS Statistics version 21.

Findings: The results of multivariate analysis of variance indicated significant differences among the study groups in all dimensions of alexithymia and pain severity at the posttest stage ($p < .001$). Significant effects were observed for difficulty identifying feelings, $F = 181.32$, difficulty describing feelings, $F = 184.71$, externally oriented thinking, $F = 49.02$, affective pain perception, $F = 120.88$, sensory pain perception, $F = 63.81$, evaluative pain perception, $F = 44.82$, and total pain severity, $F = 40.45$. Bonferroni post hoc comparisons demonstrated that both MBSR and CBT significantly reduced alexithymia and pain severity compared with the control group ($p < .001$). Moreover, the MBSR group showed significantly greater reductions in total pain severity and emotional dysfunction compared with the CBT group.

Conclusion: Both Mindfulness-Based Stress Reduction and Cognitive-Behavioral Therapy were effective in reducing pain severity and alexithymia among women with fibromyalgia. However, the mindfulness-based intervention demonstrated greater effectiveness in improving emotional regulation and reducing pain-related symptoms.

Keywords: *Fibromyalgia, Mindfulness-Based Stress Reduction Program, Cognitive-Behavioral Therapy, Pain Severity, Alexithymia*

1. Introduction

Fibromyalgia is a chronic and complex musculoskeletal pain disorder characterized by widespread pain, persistent fatigue, sleep disturbances, cognitive dysfunction, and psychological distress. In recent decades, fibromyalgia has attracted increasing attention because of its multifactorial nature and its substantial impact on patients' physical, emotional, and social functioning. The disorder is more prevalent among women and is frequently accompanied by emotional dysregulation, anxiety, depression, and impaired quality of life (Al Sharie et al., 2024; Alexander et al., 2020). Although the exact etiology of fibromyalgia remains unclear, contemporary evidence suggests that abnormalities in central pain processing, neuroendocrine dysfunction, autonomic dysregulation, and psychosocial stressors play significant roles in the development and persistence of symptoms (Balducci et al., 2024; Perrot, 2019). Research has demonstrated that patients with fibromyalgia exhibit altered neural activity in brain regions associated with emotional regulation and pain perception, indicating that chronic pain and emotional processing are closely interconnected phenomena rather than independent clinical manifestations (Balducci et al., 2024). Consequently, purely biomedical approaches have often proven insufficient for the management of fibromyalgia, and increasing emphasis has been placed on biopsychosocial and psychologically informed interventions.

One of the most significant psychological characteristics observed in patients with fibromyalgia is alexithymia, which refers to difficulties in identifying, describing, and processing emotions. Alexithymia has been consistently associated with chronic pain disorders and is considered an important factor in the maintenance and exacerbation of pain symptoms. Individuals with alexithymia often experience impaired emotional awareness and difficulty regulating negative affective states, which may increase physiological stress responses and amplify pain sensitivity (Knox et al., 2025; Siegel et al., 2018). Studies have shown that emotional distress and cumulative psychological burden contribute significantly to the subjective experience of chronic pain and may influence both pain severity and treatment responsiveness (Knox et al., 2025). In patients with fibromyalgia, difficulties in emotional processing may lead to maladaptive coping strategies such as emotional suppression, catastrophizing, avoidance behaviors, and excessive focus on bodily symptoms, all of which contribute to functional impairment and decreased psychological well-being (King, 2021; Perrot, 2019). Emotional dysregulation has also been linked to alterations in autonomic nervous system functioning and heightened physiological arousal, thereby reinforcing the chronic pain cycle (Siegel et al., 2018). Therefore, interventions that target emotional awareness, stress reduction, and adaptive cognitive functioning may play a critical role in improving outcomes among individuals with fibromyalgia.

Traditional pharmacological approaches for fibromyalgia management often provide only partial symptom relief and may be associated with adverse effects, long-term dependency, or limited effectiveness in addressing emotional and cognitive dimensions of the disorder. Because fibromyalgia involves interactions between biological, psychological, and social processes, nonpharmacological interventions have gained substantial empirical support in recent years (Samami et al., 2021). Psychological interventions, particularly Cognitive-Behavioral Therapy (CBT) and Mindfulness-Based Stress Reduction (MBSR), have emerged as two of the most widely studied approaches for chronic pain management. Cognitive-Behavioral Therapy is grounded in the premise that maladaptive thoughts, beliefs, and behaviors contribute to emotional distress and pain-related disability. Through cognitive restructuring, behavioral activation, relaxation training, and coping skills development, CBT aims to modify dysfunctional cognitive patterns and improve adaptive responses to pain (Beck, 2020; Knoerl et al., 2016). Theoretical and clinical models of CBT emphasize that changing pain-related cognitions can alter emotional reactions and reduce the amplification of pain signals within the central nervous system (Thorn, 2020). Numerous investigations have demonstrated the effectiveness of CBT in reducing chronic pain severity, improving physical functioning, and enhancing psychological adjustment among patients with chronic pain disorders (Bushey et al., 2022; Guarino et al., 2018).

Mindfulness-Based Stress Reduction represents another influential psychological intervention that has shown promising effects in chronic pain populations. Developed by Jon Kabat-Zinn, MBSR integrates mindfulness meditation, body awareness practices, and nonjudgmental attention to present-moment experiences in order to reduce stress and improve emotional regulation (Kabat-Zinn, 2013). Unlike approaches that primarily seek to challenge or replace maladaptive cognitions, mindfulness-based interventions encourage acceptance and awareness of thoughts, emotions,

E-ISSN: 2980-9681

and bodily sensations without avoidance or excessive emotional reactivity. This process may reduce experiential avoidance and foster greater psychological flexibility, thereby improving patients' ability to cope with chronic pain conditions (Oren-Schwartz et al., 2023; Phan et al., 2022). Neuropsychological evidence suggests that mindfulness practices can influence neural networks involved in attention regulation, emotional processing, and pain modulation, potentially leading to reductions in both physical and emotional suffering (Balducci et al., 2024; Bernier Carney et al., 2020). Furthermore, stress reduction interventions have been associated with favorable biological and neurophysiological outcomes in individuals with chronic pain, including reduced inflammatory responses and improved autonomic regulation (Bernier Carney et al., 2020).

Recent empirical evidence has increasingly compared mindfulness-based interventions with Cognitive-Behavioral Therapy in chronic pain populations. Although both approaches have demonstrated beneficial effects, some findings suggest that mindfulness-based interventions may exert stronger effects on emotional regulation and stress-related dimensions of chronic pain, whereas CBT may be particularly effective in modifying maladaptive cognitive appraisals and behavioral patterns (Zgierska et al., 2021; Zgierska et al., 2025). Randomized clinical trials have shown that both mindfulness-based therapy and CBT can significantly reduce pain intensity and psychological distress among individuals receiving treatment for chronic pain conditions (Zgierska et al., 2025). However, the mechanisms underlying these improvements may differ across interventions. CBT primarily focuses on restructuring distorted cognitions and enhancing coping skills, whereas mindfulness-based interventions emphasize acceptance, present-centered awareness, and emotional openness (Beck, 2020; Kabat-Zinn, 2013). Given the strong relationship between alexithymia and emotional dysregulation in fibromyalgia, interventions that directly enhance emotional awareness and mindful attention may have particular clinical relevance for these patients.

Despite the growing body of literature on psychological interventions for chronic pain, several important gaps remain in the existing research. First, although many studies have examined pain reduction outcomes, fewer investigations have specifically focused on alexithymia and emotional processing deficits in patients with fibromyalgia (Samami et al., 2021). This limitation is notable because emotional dysregulation appears to be a central component of fibromyalgia symptomatology and may influence treatment effectiveness. Second, comparative studies evaluating the relative effectiveness of MBSR and CBT in women with fibromyalgia remain limited, particularly in non-Western populations. Cultural and contextual factors may influence emotional expression, coping styles, and treatment responsiveness, underscoring the importance of conducting research across diverse populations. Third, some previous studies have primarily focused on short-term symptom reduction without considering the broader emotional and cognitive processes associated with chronic pain (Goldstein et al., 2019). Given that chronic pain is deeply interconnected with psychological functioning, examining both pain severity and alexithymia may provide a more comprehensive understanding of therapeutic outcomes.

The importance of investigating psychological interventions for women with fibromyalgia is further emphasized by the unique psychosocial burdens experienced by female patients. Women with fibromyalgia frequently report higher levels of stress, interpersonal difficulties, emotional suppression, and role-related strain, all of which may exacerbate pain experiences and emotional dysfunction (Alexander et al., 2020; King, 2021). Chronic pain may also contribute to reduced social participation, occupational impairment, and diminished self-efficacy, thereby creating a cycle of psychological vulnerability and physical distress. Because mindfulness-based interventions and CBT both target psychological processes associated with chronic pain, identifying the relative strengths of these interventions may assist clinicians in selecting more effective and individualized treatment approaches for women with fibromyalgia.

Moreover, emerging evidence from systematic reviews and meta-analyses supports the integration of psychological interventions into multidisciplinary chronic pain treatment programs (Goldstein et al., 2019; Samami et al., 2021). These approaches not only contribute to pain reduction but may also improve emotional functioning, resilience, and quality of life. The growing emphasis on patient-centered and nonpharmacological pain management strategies further highlights the clinical relevance of comparing evidence-based psychological interventions. Given the increasing recognition of emotional dysregulation as a critical component of fibromyalgia, evaluating interventions that address both cognitive and emotional dimensions may provide valuable implications for clinical practice and future research.

E-ISSN: 2980-9681

Therefore, the present study aimed to compare the effectiveness of the Mindfulness-Based Stress Reduction program and Cognitive-Behavioral Therapy on pain severity and alexithymia in women with fibromyalgia.

2. Methods and Materials

2.1. Study Design and Participants

The present study employed a quasi-experimental design with a pretest–posttest structure and a control group. The statistical population consisted of all women diagnosed with fibromyalgia who attended the rheumatology clinic of Sina Hospital in Tehran between August and October 2025. These individuals had been identified based on the diagnostic criteria of the American College of Rheumatology (ACR) for fibromyalgia and experienced chronic pain and alexithymia as part of their clinical problems. The sampling method used in this study was purposive random sampling. Among individuals who met the inclusion criteria, 60 participants were initially selected purposively and then randomly assigned to three groups (two experimental groups and one control group). Based on similar studies and the statistical methods employed, the final sample size was determined to be 45 participants (15 individuals in each group). This sample size was considered appropriate for conducting statistical analyses such as multivariate analysis of variance (MANOVA) and provided adequate statistical power to examine significant differences among the groups. In addition, to minimize the potential impact of participant attrition, 10% more than the minimum required sample size was initially considered. The inclusion criteria were: diagnosis of fibromyalgia by a rheumatology specialist, age range between 25 and 55 years, a minimum of 6 months of chronic pain history, obtaining a high score on the Toronto Alexithymia Scale (TAS-20), not receiving concurrent psychological treatments, and providing written informed consent to participate in the study. The exclusion criteria included: presence of severe concurrent physical or psychiatric disorders (such as psychotic disorders), changes in pharmacological treatment during the study, absence from more than two treatment sessions, and personal willingness to withdraw from the study. This selection and sampling procedure ensured that the research findings would be generalizable to similar populations and possess high accuracy and validity. To assess the study variables, standardized and validated psychological instruments were used, the validity and reliability of which had been confirmed in previous studies. These instruments included the McGill Pain Questionnaire and the Toronto Alexithymia Scale (TAS-20).

2.2. Measures

The McGill Pain Questionnaire is one of the most widely used instruments for assessing the severity and quality of pain in patients with chronic pain conditions, including fibromyalgia. This instrument was developed by Ronald Melzack and Warren Torgerson Wall (1975) and consists of three primary components: the sensory dimension, which describes the physical characteristics of pain (such as burning, stabbing, and pressure sensations); the affective dimension, which evaluates emotional reactions to pain (such as distress, fatigue, and stress associated with pain); and the evaluative dimension, which measures the overall intensity of pain based on numerical and descriptive scales. The validity and reliability of this instrument have been confirmed in various studies. In the study conducted by Rezvani et al. (2008), the test–retest reliability of this questionnaire was reported with a Cronbach's alpha coefficient of .87.

The Toronto Alexithymia Scale, developed by Graeme J. Taylor and colleagues (1994), is one of the most commonly used instruments for assessing alexithymia. The 20-item version of this questionnaire includes three subscales: difficulty identifying feelings, difficulty describing feelings, and externally oriented thinking. The questionnaire is scored based on a 5-point Likert scale ranging from strongly disagree (1) to strongly agree (5). Higher scores indicate greater levels of alexithymia. The validity and reliability of this instrument have been confirmed in both domestic and international studies. In the study by Esmaeili Anamag et al. (2010), the reliability of this scale was reported with a Cronbach's alpha coefficient of .85.

2.3. Interventions

The Mindfulness-Based Stress Reduction (MBSR) program was implemented over eight weekly sessions, each lasting approximately 90 minutes. The intervention was based on the protocol developed by Jon Kabat-Zinn and focused on increasing present-moment awareness, nonjudgmental observation of thoughts and emotions, and reducing automatic emotional and cognitive reactions to pain. During the initial sessions, participants were introduced to the concepts of mindfulness, conscious breathing, and body awareness. Subsequent sessions included body scan exercises, mindful breathing practices,

E-ISSN: 2980-9681

sitting meditation, mindful movement, and gentle stretching exercises appropriate for patients with fibromyalgia. Participants were also trained to identify maladaptive cognitive and emotional responses associated with chronic pain and to replace avoidance and emotional suppression with acceptance-based coping strategies. Group discussions were conducted to facilitate emotional expression and awareness of bodily sensations and emotional experiences. Homework assignments, including daily mindfulness practices and self-monitoring exercises, were provided throughout the intervention. The final sessions emphasized integrating mindfulness skills into daily life situations, pain management, emotional regulation, and relapse prevention strategies.

The Cognitive-Behavioral Therapy (CBT) intervention was conducted in eight weekly sessions of approximately 90 minutes each. The protocol focused on identifying and modifying maladaptive cognitions, dysfunctional beliefs, and negative behavioral patterns associated with chronic pain and emotional difficulties in patients with fibromyalgia. In the early sessions, participants received psychoeducation regarding the relationship between thoughts, emotions, physical symptoms, and pain perception. Cognitive restructuring techniques were introduced to help participants identify irrational beliefs, catastrophic interpretations of pain, and negative automatic thoughts. Behavioral strategies such as activity scheduling, behavioral activation, relaxation training, and stress management techniques were also implemented to improve coping abilities and reduce pain-related disability. Participants were trained in problem-solving skills, emotional awareness, and adaptive communication strategies to improve emotional expression and reduce alexithymic tendencies. Homework assignments, including thought monitoring records and behavioral exercises, were administered between sessions. The final sessions focused on consolidating cognitive and behavioral skills, enhancing self-efficacy, and developing strategies for maintaining therapeutic gains and preventing relapse.

2.4. Data Analysis

To examine the effects of the interventions and compare the groups, multivariate analysis of variance (MANOVA) was employed. Bonferroni post hoc tests were used for pairwise group comparisons. All statistical analyses were conducted using IBM SPSS Statistics version 21, and the significance level was set at $p < .05$.

3. Findings and Results

The demographic findings indicated that a total of 45 women with fibromyalgia participated in the study and were equally assigned to three groups, including the Mindfulness-Based Stress Reduction (MBSR) group, the Cognitive-Behavioral Therapy (CBT) group, and the control group (15 participants in each group). In the MBSR group, the mean age of participants was 33.90 years (SD = 5.09), with an age range from 30 to 43 years. In the CBT group, the mean age was 33.50 years (SD = 5.46), and participants ranged in age from 31 to 44 years. In the control group, the mean age was 35.01 years (SD = 4.77), with ages ranging from 34 to 43 years. Overall, the age distribution across the three groups demonstrated relative homogeneity, indicating that the groups were comparable in terms of demographic characteristics at baseline.

Table 1

Descriptive Statistics for Alexithymia and Pain Severity Variables Across the Study Groups at Pretest, Posttest, and Follow-Up

Group	Variable	Pretest Mean	Pretest SD	Posttest Mean	Posttest SD	Follow-Up Mean	Follow-Up SD
Mindfulness-Based Stress Reduction (MBSR)	Difficulty Identifying Feelings	34.85	3.73	23.65	4.39	24.20	4.50
	Difficulty Describing Feelings	25.65	3.57	17.10	2.71	17.30	2.53
	Externally Oriented Thinking	14.01	2.17	8.01	1.97	8.60	1.98
	Affective Pain Perception	9.50	1.53	4.20	0.76	4.50	0.82
	Sensory Pain Perception	28.80	4.52	13.60	4.78	15.01	4.93
	Evaluative Pain Perception	31.25	3.95	17.20	3.62	18.50	3.20
	Total Pain Score	12.05	1.76	5.40	1.42	6.05	1.53
Cognitive-Behavioral Therapy (CBT)	Difficulty Identifying Feelings	33.50	4.97	22.15	4.76	22.70	4.71

E-ISSN: 2980-9681

	Difficulty Describing Feelings	24.10	3.89	13.40	2.70	14.05	2.72
	Externally Oriented Thinking	14.30	2.05	7.55	1.70	8.20	1.60
	Affective Pain Perception	9.60	1.23	5.30	0.92	5.65	0.93
	Sensory Pain Perception	29.15	3.82	19.05	3.66	20.25	3.83
	Evaluative Pain Perception	29.75	4.36	19.55	4.62	21.20	4.46
	Total Pain Score	11.85	1.81	6.54	1.91	6.96	1.31
Control	Difficulty Identifying Feelings	34.05	5.01	33.25	5.06	33.70	5.25
	Difficulty Describing Feelings	23.65	2.79	22.85	2.11	23.05	2.94
	Externally Oriented Thinking	13.30	1.97	12.90	1.99	13.40	2.08
	Affective Pain Perception	9.55	1.39	8.75	1.16	9.05	1.43
	Sensory Pain Perception	28.30	3.88	28.55	4.18	28.70	4.28
	Evaluative Pain Perception	28.95	4.39	29.25	4.49	29.35	4.29
	Total Pain Score	11.95	1.82	10.70	2.86	10.90	2.77

The descriptive findings presented in Table 1 indicate that both experimental groups demonstrated substantial reductions in alexithymia and pain severity scores from pretest to posttest, and these improvements were generally maintained during the follow-up stage. In the Mindfulness-Based Stress Reduction (MBSR) group, the mean score for difficulty identifying feelings decreased from 34.85 (SD = 3.73) at pretest to 23.65 (SD = 4.39) at posttest, while the total pain score declined from 12.05 (SD = 1.76) to 5.40 (SD = 1.42). Similar reductions were observed in the Cognitive-Behavioral Therapy (CBT) group, where difficulty identifying feelings decreased from 33.50 (SD = 4.97) to 22.15 (SD = 4.76), and total pain scores decreased from 11.85 (SD = 1.81) to 6.54 (SD = 1.91). In contrast, the control group showed only minor fluctuations across the assessment stages. Overall, the MBSR group demonstrated greater reductions in both alexithymia dimensions and pain perception variables compared to the CBT group, particularly in affective pain perception and total pain severity.

Table 2

Results of Multivariate Analysis of Covariance (MANCOVA) for Alexithymia and Pain Severity Variables at Posttest

Variable	Sum of Squares	df	Mean Square	F	p	Partial Eta Squared
Difficulty Identifying Feelings	1450.800	2	725.400	181.32	.001	.714
Difficulty Describing Feelings	907.033	2	453.517	184.71	.001	.632
Externally Oriented Thinking	352.233	2	176.117	49.02	.001	.632
Affective Pain Perception	255.433	2	112.717	120.88	.001	.809
Sensory Pain Perception	2289.700	2	1144.850	63.81	.001	.691
Evaluative Pain Perception	1632.100	2	816.050	44.82	.001	.611
Total Pain Score	315.033	2	157.517	40.45	.001	.587

The results presented in Table 2 demonstrated significant differences among the study groups in all dimensions of alexithymia and pain severity at the posttest stage. Regarding alexithymia, significant group differences were observed for difficulty identifying feelings, $F(2, 42) = 181.32$, $p = .001$, $\eta^2 = .714$, difficulty describing feelings, $F(2, 42) = 184.71$, $p = .001$, $\eta^2 = .632$, and externally oriented thinking, $F(2, 42) = 49.02$, $p = .001$, $\eta^2 = .632$. Similarly, significant differences were found for all pain-related variables, including affective pain perception, $F(2, 42) = 120.88$, $p = .001$, $\eta^2 = .809$, sensory pain perception, $F(2, 42) = 63.81$, $p = .001$, $\eta^2 = .691$, evaluative pain perception, $F(2, 42) = 44.82$, $p = .001$, $\eta^2 = .611$, and total pain score, $F(2, 42) = 40.45$, $p = .001$, $\eta^2 = .587$. The effect sizes indicated that the interventions had substantial effects on reducing alexithymia and pain severity variables, with the strongest effect observed for affective pain perception.

E-ISSN: 2980-9681

Table 3

Bonferroni Pairwise Comparisons of the Study Groups for Alexithymia and Pain Severity Variables at Posttest

Dependent Variable	Group Comparison	Mean Difference	Standard Error	p	Lower Bound	Upper Bound
Total Alexithymia	MBSR vs. CBT	-1.50	1.50	.322	-4.51	1.51
	MBSR vs. Control	-9.60*	1.50	.001	-12.59	-6.59
	CBT vs. Control	-11.10*	1.50	.001	-14.11	-8.09
Difficulty Identifying Feelings	MBSR vs. CBT	-0.95	1.12	.401	-3.21	1.31
	MBSR vs. Control	-10.40*	1.12	.001	-12.66	-8.14
	CBT vs. Control	-9.45*	1.12	.001	-11.71	-7.19
Difficulty Describing Feelings	MBSR vs. CBT	1.25	0.96	.287	-0.69	3.19
	MBSR vs. Control	-5.75*	0.96	.001	-7.69	-3.81
	CBT vs. Control	-7.00*	0.96	.001	-8.94	-5.06
Externally Oriented Thinking	MBSR vs. CBT	0.46	0.58	.436	-0.71	1.63
	MBSR vs. Control	-4.89*	0.58	.001	-6.06	-3.72
	CBT vs. Control	-5.35*	0.58	.001	-6.52	-4.18
Total Pain Severity	MBSR vs. CBT	-1.10*	0.30	.001	-1.56	-0.49
	MBSR vs. Control	-4.55*	0.30	.001	-5.16	-3.94
	CBT vs. Control	-3.45*	0.30	.001	-4.06	-2.84
Affective Pain Perception	MBSR vs. CBT	-1.05*	0.24	.001	-1.53	-0.57
	MBSR vs. Control	-4.50*	0.24	.001	-4.98	-4.02
	CBT vs. Control	-3.45*	0.24	.001	-3.93	-2.97
Sensory Pain Perception	MBSR vs. CBT	-5.45*	1.04	.001	-7.55	-3.35
	MBSR vs. Control	-14.95*	1.04	.001	-17.05	-12.85
	CBT vs. Control	-9.50*	1.04	.001	-11.60	-7.40
Evaluative Pain Perception	MBSR vs. CBT	-2.35*	0.98	.018	-4.33	-0.37
	MBSR vs. Control	-12.05*	0.98	.001	-14.03	-10.07
	CBT vs. Control	-9.70*	0.98	.001	-11.68	-7.72

*p < .05

The Bonferroni post hoc comparisons presented in Table 3 revealed significant differences between the experimental groups and the control group across all alexithymia and pain severity variables at posttest. For total alexithymia, both the Mindfulness-Based Stress Reduction (MBSR) group and the Cognitive-Behavioral Therapy (CBT) group showed significantly lower scores than the control group (p = .001), whereas the difference between the two intervention groups was not statistically significant (p = .322). Similar patterns were observed in the alexithymia subcomponents, including difficulty identifying feelings, difficulty describing feelings, and externally oriented thinking. Regarding pain severity variables, significant differences were found between all three groups. The MBSR group demonstrated significantly lower total pain severity scores compared with both the CBT and control groups (p = .001), indicating greater effectiveness of mindfulness-based intervention in pain reduction. Significant differences were also observed for affective, sensory, and evaluative pain perception components, with the MBSR group consistently showing the greatest reductions, followed by the CBT group, while the control group exhibited the highest pain severity scores.

4. Discussion and Conclusion

The present study aimed to compare the effectiveness of the Mindfulness-Based Stress Reduction (MBSR) program and Cognitive-Behavioral Therapy (CBT) on pain severity and alexithymia in women with fibromyalgia. The findings demonstrated that both interventions significantly reduced pain severity and alexithymia compared with the control group. Furthermore, the results indicated that the MBSR intervention showed greater effectiveness than CBT in reducing overall pain severity and improving emotional functioning. These findings highlight the important role of psychological interventions in the management of fibromyalgia and support the growing emphasis on biopsychosocial approaches to chronic pain treatment (Al Sharie et al., 2024; Perrot, 2019).

One of the central findings of the present study was the significant reduction in pain severity among participants who received MBSR and CBT interventions. These results are consistent with previous research indicating that psychological interventions can effectively reduce chronic

E-ISSN: 2980-9681

pain intensity and pain-related disability (Bushey et al., 2022; Knoerl et al., 2016). Chronic pain in fibromyalgia is no longer understood solely as a peripheral physiological phenomenon; instead, contemporary models emphasize the role of central sensitization, emotional dysregulation, maladaptive cognition, and stress-related neurophysiological responses in maintaining pain experiences (Balducci et al., 2024; Perrot, 2019). In this context, both MBSR and CBT appear capable of modifying the psychological and neurocognitive mechanisms associated with pain amplification. Cognitive-Behavioral Therapy may reduce pain severity by helping patients identify catastrophic beliefs, maladaptive interpretations, and dysfunctional coping patterns related to pain experiences (Beck, 2020; Thorn, 2020). Through cognitive restructuring and behavioral activation, patients gradually develop more adaptive responses to pain, which may decrease emotional distress and perceived pain intensity.

Similarly, the effectiveness of CBT observed in the present study aligns with previous evidence demonstrating the utility of cognitive-behavioral approaches for chronic pain management (Bushey et al., 2022; Guarino et al., 2018). Previous investigations have shown that CBT improves pain coping skills, enhances self-efficacy, and reduces pain catastrophizing, all of which contribute to better psychological adjustment among individuals with chronic pain conditions (Knoerl et al., 2016). The reduction in pain severity observed among participants receiving CBT in this study may therefore be explained by improved cognitive appraisal processes and greater behavioral control over pain-related responses. In addition, CBT likely contributed to reductions in emotional distress, anxiety, and helplessness associated with chronic pain experiences, thereby interrupting the reciprocal relationship between emotional tension and pain perception.

However, the findings also revealed that the MBSR intervention demonstrated greater effectiveness than CBT in reducing pain severity, particularly in affective and total pain perception. This result is consistent with emerging evidence suggesting that mindfulness-based interventions may exert stronger effects on emotional and stress-related aspects of chronic pain (Zgierska et al., 2021; Zgierska et al., 2025). Mindfulness-based interventions encourage individuals to observe painful sensations and emotional experiences without judgment, avoidance, or excessive cognitive elaboration. This process may reduce emotional reactivity and decrease the amplification of pain signals associated with anticipatory fear, rumination, and stress responses (Kabat-Zinn, 2013). By cultivating present-moment awareness and nonreactive attention, individuals may experience pain with reduced emotional suffering and greater psychological acceptance. The findings of Bernier Carney et al. regarding the biological effects of stress reduction interventions further support this interpretation, suggesting that mindfulness practices may influence autonomic regulation and stress-related physiological pathways associated with chronic pain (Bernier Carney et al., 2020).

Another important finding of the present study was the significant reduction in alexithymia among participants in both intervention groups. Alexithymia is highly prevalent among individuals with fibromyalgia and is associated with impaired emotional awareness, emotional suppression, and difficulties in identifying and communicating emotions (King, 2021). Emotional dysregulation may contribute to chronic activation of physiological stress systems and intensification of pain perception. Therefore, interventions that enhance emotional processing abilities may improve both psychological and physical outcomes in fibromyalgia patients. The observed reductions in alexithymia are consistent with the broader literature indicating that psychological interventions can improve emotional awareness and emotional regulation capacities among individuals experiencing chronic pain and stress-related disorders (Goldstein et al., 2019; Oren-Schwartz et al., 2023).

The greater effectiveness of MBSR in reducing alexithymia may be explained by the central role of mindfulness in fostering emotional awareness and acceptance. Mindfulness practices encourage individuals to observe internal experiences, including emotions, bodily sensations, and thoughts, with openness and curiosity rather than avoidance or suppression (Kabat-Zinn, 2013). This process may directly address the core dimensions of alexithymia, including difficulty identifying feelings and difficulty describing emotions. The findings of Oren-Schwartz et al. demonstrated that mindfulness-based interventions can facilitate emotional recovery and reduce maladaptive emotional responses among individuals exposed to psychological distress (Oren-Schwartz et al., 2023). Similarly, mindfulness training may help individuals with fibromyalgia become more aware of emotional experiences associated with chronic pain, thereby improving emotional differentiation and adaptive emotional processing.

E-ISSN: 2980-9681

The findings regarding emotional regulation are also consistent with neuropsychological evidence demonstrating abnormal emotional processing networks in individuals with fibromyalgia (Balducci et al., 2024). Functional neuroimaging studies have suggested that chronic pain patients often exhibit dysregulated neural activity in regions involved in affective processing, attention, and interoceptive awareness. Mindfulness-based interventions may positively influence these neural systems by increasing attentional control, reducing emotional hyperreactivity, and improving self-regulatory functioning. This neurocognitive perspective may partly explain why participants in the MBSR group experienced greater improvements in both pain severity and alexithymia compared with those in the CBT group.

Although CBT was somewhat less effective than MBSR in the present study, its significant benefits should not be overlooked. CBT remains one of the most empirically supported interventions for chronic pain and emotional dysfunction (Beck, 2020; Thorn, 2020). Cognitive restructuring techniques may help patients reinterpret pain experiences in less threatening ways and challenge dysfunctional beliefs related to helplessness and disability. Moreover, CBT's emphasis on behavioral activation and coping skill development may enhance patients' perceived control over symptoms and improve daily functioning. The effectiveness of CBT in the current study supports previous findings indicating that cognitive and behavioral interventions remain highly valuable components of multidisciplinary fibromyalgia treatment programs (Samami et al., 2021).

The findings of the present study also support broader theoretical perspectives emphasizing the interconnectedness of emotional processes and chronic pain experiences. Research has consistently shown that emotional distress, stress accumulation, and psychological vulnerability contribute substantially to chronic pain intensity and disability (Knox et al., 2025). Patients with fibromyalgia frequently experience persistent emotional strain, interpersonal stress, and difficulties regulating negative affective states, all of which may contribute to heightened physiological arousal and pain sensitivity (King, 2021). By targeting these psychological mechanisms, both MBSR and CBT may disrupt the reciprocal cycle between emotional distress and pain amplification. The findings of Zgierska et al. further support this interpretation, demonstrating that mindfulness-based interventions and CBT can both improve chronic pain outcomes, although through partially distinct therapeutic pathways (Zgierska et al., 2021; Zgierska et al., 2025).

The maintenance of treatment gains during the follow-up stage is another important aspect of the findings. Participants in both intervention groups generally maintained improvements in pain severity and alexithymia over time, suggesting that the acquired psychological skills remained beneficial beyond the immediate treatment period. This persistence of therapeutic effects may indicate that participants internalized adaptive coping strategies and emotional regulation skills. In mindfulness-based interventions, continued practice of mindful awareness and acceptance may help individuals manage stressors more effectively in daily life. Similarly, CBT participants may have continued utilizing cognitive restructuring and behavioral coping strategies following the completion of treatment sessions. These findings reinforce the importance of psychological self-regulation skills in long-term chronic pain management.

Overall, the present study contributes to the growing body of evidence supporting the effectiveness of psychological interventions for fibromyalgia. The findings emphasize that chronic pain management should not be limited to pharmacological treatment alone but should also incorporate interventions targeting emotional functioning, cognitive processes, and stress regulation. Given the multidimensional nature of fibromyalgia, integrated therapeutic approaches addressing both psychological and physiological dimensions are likely to produce more comprehensive and sustainable outcomes. The superior effectiveness of MBSR in improving pain severity and alexithymia also suggests that interventions emphasizing emotional awareness, acceptance, and mindfulness may hold particular value for patients experiencing chronic pain conditions characterized by emotional dysregulation.

One limitation of the present study was the relatively small sample size and the restriction of participants to women attending a single clinical center, which may limit the generalizability of the findings to broader populations. In addition, the study relied primarily on self-report questionnaires for assessing pain severity and alexithymia, which may have been influenced by response bias or participants' subjective interpretations. The absence of long-term follow-up beyond the immediate post-intervention period also limited the ability to evaluate the long-term stability of treatment effects. Furthermore, potential moderating variables such as medication adherence,

E-ISSN: 2980-9681

socioeconomic status, and comorbid psychiatric symptoms were not fully controlled during the study.

Future research should investigate the long-term effectiveness of mindfulness-based interventions and Cognitive-Behavioral Therapy in more diverse clinical populations and across different cultural contexts. Studies with larger sample sizes and longer follow-up periods would provide a more comprehensive understanding of treatment durability and relapse prevention. Future investigations may also examine the neurobiological and physiological mechanisms underlying improvements in emotional regulation and pain perception following psychological interventions. In addition, comparing combined or integrative therapeutic approaches that incorporate both mindfulness and cognitive-behavioral components may help identify more effective intervention models for fibromyalgia management.

The findings of the present study suggest that healthcare professionals working with patients diagnosed with fibromyalgia should incorporate psychological interventions into comprehensive treatment programs. Mindfulness-based interventions may be particularly useful for improving emotional awareness and reducing stress-related pain responses, while Cognitive-Behavioral Therapy may help patients modify maladaptive beliefs and coping behaviors. Clinical centers and rehabilitation programs may benefit from integrating structured psychological services into routine fibromyalgia care. Providing education regarding emotional regulation, stress management, and adaptive coping strategies may also improve patients' quality of life and reduce the psychological burden associated with chronic pain conditions.

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

Al Sharie, S., Varga, S. J., Al-Husinat, L. I., Sarzi-Puttini, P., Araydah, M., & Bal'awi, B. R. (2024). Unraveling the complex web of fibromyalgia: A narrative review. *Medicina*, *60*(2), 272.

Alexander, L. L., LaRosa, J. H., Bader, H., & Garfield, S. (2020). *New Dimensions in Women's Health*. Jones and Bartlett Learning.

Balducci, T., Garza-Villarreal, E. A., Valencia, A., Aleman, A., & van Tol, M. J. (2024). Abnormal functional neurocircuitry underpinning emotional processing in fibromyalgia. *European Archives of Psychiatry and Clinical Neuroscience*, *274*(1), 151-164.

Beck, J. S. (2020). *Cognitive Behavior Therapy: Basics and Beyond*. Guilford Publications.

Bernier Carney, K. M., Young, E. E., Guite, J. W., & Starkweather, A. R. (2020). A systematic review of biological mechanisms and chronic pain outcomes during stress reduction interventions. *Biological Research For Nursing*, *22*(2), 205-216.

Bushey, M. A., Slaven, J. E., Outcalt, S. D., Kroenke, K., Kempf, C., & Froman, A. (2022). Effect of medication optimization vs cognitive behavioral therapy among US veterans with chronic low back pain receiving long-term opioid therapy: A randomized clinical trial. *JAMA Network Open*, *5*(11), e2242533.

Goldstein, E., McDonnell, C., Atchley, R., Dorado, K., Bedford, C., & Brown, R. L. (2019). The impact of psychological interventions on posttraumatic stress disorder and pain symptoms: A systematic review and meta-analysis. *The Clinical Journal of Pain*, *35*(8), 703-712.

Guarino, H., Fong, C., Marsch, L. A., Acosta, M. C., Syckes, C., & Moore, S. K. (2018). Web-based cognitive behavior therapy for chronic pain patients with aberrant drug-related behavior: Outcomes from a randomized controlled trial. *Pain Medicine*, *19*(12), 2423-2437.

Kabat-Zinn, J. (2013). Some reflections on the origins of MBSR, skillful means, and the trouble with maps. In *Mindfulness* (pp. 281-306). Routledge.

King, F. (2021). *Forgiveness, anger and stress in patients with Fibromyalgia syndrome and controls* LMU].

E-ISSN: 2980-9681

Knoerl, R., Lavoie Smith, E. M., & Weisberg, J. (2016). Chronic pain and cognitive behavioral therapy: An integrative review. *Western Journal of Nursing Research*, *38*(5), 596-628.

Knox, P. J., Simon, C. B., Pohlig, R. T., Pugliese, J. M., Coyle, P. C., & Sions, J. M. (2025). Effects of individual psychological factors and cumulative psychological distress on prospective pain quality in older adults with chronic low back pain. *The Clinical Journal of Pain*, *41*(7), e1294.

Oren-Schwartz, R., Aizik-Reebs, A., Yuval, K., Hadash, Y., & Bernstein, A. (2023). Effect of mindfulness-based trauma recovery for refugees on shame and guilt in trauma recovery among African asylum-seekers. *Emotion*, *23*(3), 622.

Perrot, S. (2019). Fibromyalgia: A misconnection in a multiconnected world? *European Journal of Pain*, *23*(5), 866-873.

Phan, M. L., Renshaw, T. L., Caramanico, J., Greeson, J. M., MacKenzie, E., & Atkinson-Diaz, Z. (2022). Mindfulness-based school interventions: A systematic review of outcome evidence quality by study design. *Mindfulness*, *13*(7), 1591-1613.

Samami, E., Shahhosseini, Z., & Elyasi, F. (2021). The effect of psychological interventions on the quality of life in women with fibromyalgia: A systematic review. *Journal of Clinical Psychology in Medical Settings*, *28*(3), 503-517.

Siegel, E. H., Sands, M. K., Van den Noortgate, W., Condon, P., Chang, Y., & Dy, J. (2018). Emotion fingerprints or emotion populations? A meta-analytic investigation of autonomic features of emotion categories. *Psychological bulletin*, *144*(4), 343.

Thorn, B. E. (2020). Ronald Melzack Award Lecture: Putting the brain to work in cognitive behavioral therapy for chronic pain. *Pain*, *161*, S27-S35.

Zgierska, A. E., Burzinski, C. A., Garland, E. L., Lennon, R. P., Jamison, R., & Nakamura, Y. (2021). Mindfulness-based therapy compared to cognitive behavioral therapy for opioid-treated chronic low back pain: Protocol for a pragmatic randomized controlled trial. *Contemporary Clinical Trials*, *110*, 106548.

Zgierska, A. E., Edwards, R. R., Barrett, B., Burzinski, C. A., Jamison, R. N., & Nakamura, Y. (2025). Mindfulness vs Cognitive Behavioral Therapy for Chronic Low Back Pain Treated With Opioids: A Randomized Clinical Trial. *JAMA Network Open*, *8*(4), e253204.

E-ISSN: 2980-9681