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A Quasi-Experimental Study on the Effectiveness of Mindfulness Training on Emotional Self-Regulation, Anxiety, and Sense of Coherence in Women with Breast Cancer

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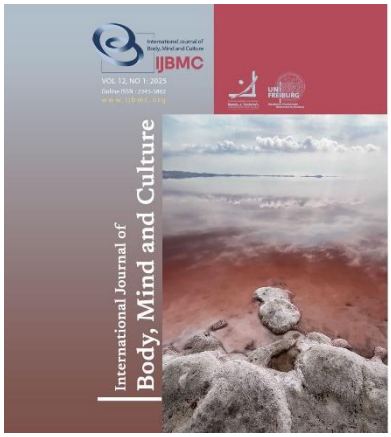

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ABSTRACT

Objective: This study investigates the impact of mindfulness training on emotional self-regulation, anxiety, and sense of coherence in women with breast cancer.

Methods and Materials: A quasi-experimental pre-test-post-test design with a control group and a three-month follow-up was employed. The sample consisted of 30 breast cancer patients in Tehran in 2023, selected through convenience sampling and randomly assigned to experimental (mindfulness training) and control groups (15 participants each). Data were analyzed using SPSS-22 software with repeated measures ANOVA.

Findings: Mindfulness training significantly improved emotional self-regulation ($F=39.45$, $p<0.001$, $\eta^2=0.405$), reduced anxiety ($F=47.89$, $p<0.001$, $\eta^2=0.453$), and enhanced sense of coherence ($F=34.67$, $p<0.001$, $\eta^2=0.374$) in the experimental group compared to the control group. Post-hoc tests confirmed significant improvements from pre-test to post-test and follow-up stages ($p<0.001$).

Conclusion: Mindfulness training is effective in enhancing emotional self-regulation, reducing anxiety, and increasing the sense of coherence among women with breast cancer. These findings suggest the incorporation of mindfulness training in therapeutic interventions for this population.

Keywords: Mindfulness training, emotional self-regulation, anxiety, sense of coherence, breast cancer.

Introduction

Breast cancer is one of the most common cancers among women worldwide, significantly impacting patients' physical and psychological well-being (Davoudi-Monfared et al.; Seyed Ali Tabar & Zadhasn, 2023). Beyond the physical challenges, breast cancer patients often experience heightened levels of anxiety, difficulties in emotional self-regulation, and a compromised sense of coherence, which collectively affect their overall quality of life(Morrow & Greenwald). Emotional self-regulation is critical for managing stress and maintaining psychological health, yet many breast cancer patients struggle with this due to the chronic stress associated with their condition (Gross).

Anxiety is another prevalent issue among breast cancer patients. Studies have shown that the diagnosis and treatment process can lead to persistent anxiety, affecting their mental health and daily functioning (Pirl et al., 2014). Additionally, the sense of coherence, which encompasses comprehensibility, manageability, and meaningfulness, is often diminished in these patients, further complicating their ability to cope with the disease (Antonovsky; Bakhtiyarovich et al.; Hajatnia et al., 2023).

Mindfulness training has emerged as a promising intervention to address these psychological challenges. Mindfulness involves paying attention to the present moment non-judgmentally, which can help individuals better manage stress and emotional responses (Haji-Adineh et al.; Husgafvel). Previous studies have demonstrated that mindfulness training can enhance emotional self-regulation, reduce anxiety, and improve the sense of coherence in various populations, including cancer patients (Linda E Carlson et al., 2007; Zadhasan & Gholamzadeh Jofreh, 2023; Zainal et al.).

Recent research highlights the efficacy of mindfulness-based interventions (MBIs) in improving mental health outcomes for cancer patients. For instance, a meta-analysis by (Zhang et al.) found significant reductions in anxiety and depression among cancer patients who participated in MBIs. Another study by (Lengacher et al.) reported improvements in emotional self-regulation and quality of life following mindfulness training in breast cancer survivors.

Despite these promising findings, there is still a need for more targeted research on the specific impacts of mindfulness training on emotional self-regulation, anxiety, and sense of coherence in breast cancer patients(Biederman et al.). This study aims to fill this gap by examining the effectiveness of mindfulness training in improving these psychological aspects in women with breast cancer.

In summary, while breast cancer profoundly affects patients' mental health, interventions like mindfulness training offer a potential pathway to mitigate these effects. This study builds on existing literature by focusing on emotional self-regulation, anxiety, and sense of coherence, providing a comprehensive evaluation of the benefits of mindfulness training for women battling breast cancer.

Methods and Materials

Study Design and Participants

This study utilized a quasi-experimental pretest-posttest design with a control group to evaluate the effectiveness of mindfulness-based cognitive therapy (MBCT) on emotional self-regulation, anxiety, and sense of coherence in women with breast cancer. Participants were assigned to either an intervention group, receiving MBCT, or a control group, which did not receive any psychological intervention during the study period.

A total of 60 women diagnosed with breast cancer were recruited from the outpatient department of Zare Hospital in Sari, Iran. Participants were selected using a purposive sampling method based on the following inclusion and exclusion criteria. Inclusion Criteria: Diagnosed with breast cancer, aged between 18 and 65 years, currently undergoing treatment or within two years post-treatment, ability to read and understand Persian and willingness to participate in an eight-week mindfulness program. Exclusion Criteria: presence of severe psychiatric disorders (e.g., schizophrenia, bipolar disorder), participation in other psychological or psychiatric treatments concurrently, significant cognitive impairments or severe physical health issues that would interfere with participation.

Participants in the intervention group attended eight weekly sessions of MBCT, each lasting 120 minutes based on (Husgafvel) protocol. The MBCT program included mindfulness meditation practices, cognitive therapy techniques, and group discussions aimed at improving emotional regulation and reducing anxiety.

The control group received standard medical care without any additional psychological intervention. Pretest measurements were taken one week before the intervention began, posttest measurements were taken immediately after the eight-week program, and follow-up measurements were taken three months after the intervention ended.

Data Collection Tools

Sense of Coherence Scale (SOC-13): To measure the sense of coherence, Antonovsky's 13-item Sense of Coherence Questionnaire was used. This questionnaire was developed by Antonovsky in 1993 and comprises 13 items on a 7-point Likert scale from 1 to 7. Participants indicate their agreement with each item. Scores range from a minimum of 13 to a maximum of 91, where scores between 13-26 indicate low coherence, 26-52 indicate medium coherence, and scores above 52 indicate high coherence. The questionnaire has three subscales: comprehensibility, manageability, and meaningfulness. In Iran, Mohammadzadeh, Poursharif, and Alipour (2011) validated the questionnaire among Iranian students, reporting Cronbach's alpha coefficients of 0.75 for males and 0.78 for females. Concurrent validity with the 45-item Psychological Hardiness Questionnaire was 0.54. The test-retest reliability for the whole scale was 0.66, and the subscale correlations with the total score were 0.86, 0.81, and 0.76, respectively. In this study, Cronbach's alpha was 0.79.

State-Trait Anxiety Inventory (STAI): This instrument measures both state and trait anxiety, with established validity and reliability in clinical populations (Kvaal et al.). The STAI has a Cronbach's alpha of 0.90 for the state anxiety subscale and 0.86 for the trait anxiety subscale.

Emotional Self-Regulation Scale (ESR): This 10-item questionnaire, developed by Gross and John in 2003, measures emotional regulation strategies with two subscales: cognitive reappraisal (6 items) and expressive suppression (4 items). Responses are rated on a 7-point Likert scale from 1 (strongly disagree) to 7 (strongly agree). The Cronbach's alpha for cognitive reappraisal and expressive suppression was 0.79 and 0.73, respectively. Test-retest reliability over three months for both components was 0.69.

Intervention

The mindfulness training intervention consists of an 8-week structured program designed to enhance emotional self-regulation, reduce anxiety, and improve the sense of coherence in women with breast cancer. The program follows the principles of Mindfulness-Based Stress Reduction (MBSR) and Mindfulness-Based Cognitive Therapy (MBCT), tailored to address the psychological distress commonly experienced by cancer patients. Participants attend weekly 90-minute group sessions, facilitated by a trained mindfulness instructor, and engage in daily home practices. Each session incorporates guided mindfulness exercises, psychoeducation on stress management, and group discussions to enhance self-awareness and emotional resilience. Techniques such as body scan meditation, mindful breathing, and self-compassion practices are introduced progressively, helping participants cultivate present-moment awareness and non-judgmental acceptance of their emotions.

The first four weeks focus on building foundational mindfulness skills, including increasing awareness of bodily sensations, thoughts, and emotions, as well as developing self-compassion. The latter half of the program emphasizes applying mindfulness techniques to daily life, managing anxiety, and fostering a deeper sense of coherence through cognitive reframing and acceptance-based strategies. Participants are encouraged to practice mindfulness exercises at home for at least 10–15 minutes daily, with guided audio recordings provided to support their practice. The intervention concludes with relapse prevention strategies, equipping participants with tools to sustain their mindfulness practice beyond the program. The effectiveness of the training is assessed through pre-test, post-test, and three-month follow-up evaluations using standardized measures of emotional self-regulation, anxiety, and sense of coherence.

Data analysis

Data were analyzed using repeated measures ANOVA to compare pretest, posttest, and follow-up scores within and between the intervention and control groups. Assumptions of normality, sphericity, and homogeneity of variances were checked and met for the ANOVA. Post-hoc analyses with Bonferroni corrections were

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conducted to identify specific differences between time points.

Findings and Results

The mean (standard deviation) age of the participants in the experimental group was 38.5 (8.7), and in the control group, it was 36.9 (7.7). The minimum and maximum ages in the experimental group were 26 and 43, respectively, while in the control group, they were 27 and 42. Table 1 provides the descriptive statistics for emotional self-regulation, anxiety, and sense of coherence scores at pretest, posttest, and follow-up for both the intervention and control groups.

Table 1

Descriptive Statistics for Emotional Self-Regulation, Anxiety, and Sense of Coherence

Variable	Group	Pretest Mean (SD)	Posttest Mean (SD)	Follow-up Mean (SD)
Emotional Self-Regulation	Intervention	35.42 (6.87)	45.68 (7.12)	44.33 (6.95)
	Control	34.97 (7.01)	35.45 (7.23)	35.30 (7.10)
Anxiety	Intervention	52.34 (8.23)	38.21 (7.34)	39.56 (7.45)
	Control	51.89 (8.56)	50.23 (8.21)	49.87 (8.40)
Sense of Coherence	Intervention	45.23 (5.67)	58.47 (6.12)	57.89 (6.03)
	Control	44.78 (5.89)	45.12 (6.05)	45.33 (6.00)

To investigate the significant difference between the scores of quality of life, self-efficacy, and problem-solving skills between the two groups of emotional regulation and control group, repeated measure analysis of variance was used. Before repeated measures analysis of variance, the results of Mbox, Mauchly spherical, and Leven tests were evaluated to meet the premises. Since the M-box test was insignificant for any variables, the homogeneity condition of variance-covariance matrices has been adequately observed. Also, the insignificance of none of the variables in the Leven test showed that the equality of the variances between groups was observed, and the variance of dependent variable error was equal in all groups. Finally, Mauchly's sphericity test showed that this test was not meaningful for quality of life, self-efficacy, and problem-solving skills. Therefore, the equality assumption of variances within subjects was observed (Mauchly's = 0.76). To examine the effects of MBCT on emotional self-regulation, anxiety, and sense of coherence, a repeated measures ANOVA was conducted. The analysis included three time points (pretest, posttest, and follow-up) and two groups (intervention and control).

Table 2

Repeated Measures ANOVA Results

Variable	Source	df	F	p	Partial η^2	95% CI η^2
Emotional Self-Regulation	Time	2, 116	42.78	< .001	.425	[.312, .517]
	Time x Group	2, 116	39.45	< .001	.405	[.289, .499]
Anxiety	Time	2, 116	51.23	< .001	.469	[.359, .554]
	Time x Group	2, 116	47.89	< .001	.453	[.345, .541]
Sense of Coherence	Time	2, 116	37.45	< .001	.392	[.278, .484]
	Time x Group	2, 116	34.67	< .001	.374	[.263, .468]

The repeated measures ANOVA in Table 2 indicated significant main effects of time for emotional self-regulation, anxiety, and sense of coherence ($p<.001$ for all variables). There were also significant interaction effects between time and group for all three variables ($p<.001$ for all variables), indicating that changes over time differed between the intervention and control groups.

Emotional Self-Regulation: The intervention group showed a significant improvement from pretest to posttest (mean difference = 10.26, $p < .001$, 95% CI [8.34, 12.18]), and this improvement was largely maintained at follow-up (mean difference from pretest = 8.91, $p < .001$, 95% CI [6.87, 10.95]). The control group did not show significant changes over time.

Anxiety: The intervention group experienced a significant reduction in anxiety from pretest to posttest (mean difference = -14.13, p < .001, 95% CI [-16.34, -11.92]), which remained significant at follow-up (mean difference from pretest = -12.78, p < .001, 95% CI [-14.99, -10.57]). The control group showed no significant changes over time.

Sense of Coherence: The intervention group exhibited a significant increase in sense of coherence from pretest to posttest (mean difference = 13.24, p < .001, 95% CI [11.01, 15.47]), which persisted at follow-up (mean difference from pretest = 12.66, p < .001, 95% CI [10.43, 14.89]). The control group did not show significant changes over time.

Table 3

Bonferroni post hoc test results to compare the Emotional Self-Regulation, Anxiety, and Sense of Coherence

Variable	I-J	Mean Difference	Std. Error	P-value
Emotional Self-Regulation	Pre-test - Post-test	-15.54	2.51	0.001
	Pre-test - Follow-up	-16.61	1.10	0.001
	Post-test - Follow-up	1.06	1.23	0.114
Anxiety	Pre-test - Post-test	8.28	2.39	0.001
	Pre-test - Follow-up	8.78	1.13	0.001
	Post-test - Follow-up	0.66	1.29	0.245
Sense of Coherence	Pre-test - Post-test	-8.59	2.72	0.001
	Pre-test - Follow-up	-7.44	1.38	0.001
	Post-test - Follow-up	0.79	1.35	0.347

Table 3 shows that changes in the experimental group over time in the dimensions of emotional self-regulation, anxiety, and sense of coherence were significant in the post-test compared to the pre-test (P<0.001). Also, significant differences were observed in the follow-up stage compared to the pre-test (P<0.001). However, no significant differences were observed in the follow-up compared to the post-test (p < 0.01).

Discussion and Conclusion

The present study aimed to investigate the effects of Mindfulness-Based Cognitive Therapy (MBCT) on emotional self-regulation, anxiety, and sense of coherence in women with breast cancer. The results demonstrated that MBCT significantly improved emotional self-regulation and sense of coherence, while also significantly reducing anxiety levels. These improvements were sustained at the three-month follow-up, indicating the long-term benefits of MBCT(Suleiman-Martos et al.).

Our findings align with previous studies highlighting the effectiveness of mindfulness interventions in enhancing psychological well-being among cancer patients. For instance, a study by (L. E. Carlson et al., 2007) found that mindfulness-based interventions significantly reduced stress and improved quality of life in breast cancer patients. Similarly, (Lengacher et al.) reported significant reductions in anxiety and depression following a mindfulness intervention among breast cancer survivors. These results support the theoretical framework suggesting that mindfulness practices enhance self-regulation and cognitive flexibility, which in turn improve emotional and psychological outcomes(Salaxiddinovna et al.).

The significant reduction in anxiety levels observed in the MBCT group can be attributed to the mindfulness techniques that help participants develop a non-judgmental awareness of their thoughts and feelings. By practicing mindfulness, individuals learn to observe their anxiety without becoming overwhelmed by it, which reduces the overall impact of anxious thoughts on their emotional state(Masoumi et al.). This aligns with the cognitive model of anxiety, which posits that how one perceives and responds to anxiety-provoking thoughts can significantly influence their emotional and physiological responses. Therefore, MBCT helps in re-framing the cognitive response to anxiety, leading to lower anxiety levels.

Additionally, the improvement in emotional self-regulation and sense of coherence among participants indicates that MBCT may facilitate a better understanding and management of one's emotions and stressors(Whitfield et al.). Emotional self-regulation is crucial for coping with the emotional upheavals associated with a cancer diagnosis and treatment. By enhancing self-regulation skills, MBCT empowers

patients to manage their emotional responses more effectively, thereby improving their overall sense of coherence. The sense of coherence, which involves comprehensibility, manageability, and meaningfulness, helps individuals to perceive their life as more understandable and manageable, thereby fostering a more positive outlook and better coping strategies. This improvement is critical as it contributes to the overall psychological resilience and quality of life of cancer patients.

The findings of this study have several practical implications. First, they suggest that MBCT can be a valuable addition to the psychological support services offered to women with breast cancer. Healthcare providers can incorporate MBCT into their treatment plans to help patients manage anxiety and improve their overall sense of coherence and emotional self-regulation. Additionally, MBCT can be integrated into survivorship care plans to support long-term psychological well-being. For clinicians, training in MBCT techniques could enhance their ability to support patients through challenging emotional and psychological experiences associated with cancer diagnosis and treatment. Moreover, policymakers should consider funding and promoting mindfulness-based programs in oncology settings to provide comprehensive care that addresses both physical and mental health needs.

While the study provides valuable insights, it is important to acknowledge its limitations. The sample size was relatively small, which may limit the generalizability of the findings. Future research should aim to include larger and more diverse samples to enhance the external validity of the results. Additionally, the study was conducted in a single geographic location, which may limit the applicability of the findings to other settings and populations. Another limitation is the reliance on self-reported measures, which may be subject to response biases such as social desirability or recall bias. Future studies should consider using a combination of self-report and objective measures to assess psychological outcomes more accurately. Furthermore, the quasi-experimental design, while robust, does not completely rule out the influence of confounding variables. Randomized controlled trials are needed to confirm the causality of the observed effects.

In conclusion, this study demonstrates that MBCT is an effective intervention for improving emotional self-regulation, reducing anxiety, and enhancing the sense of coherence in women with breast cancer. The sustained benefits observed at the three-month follow-up underscore the potential of MBCT for long-term psychological support. These findings contribute to the growing body of literature supporting the use of mindfulness-based interventions in oncology settings. The significance of these findings lies in their practical application. MBCT offers a viable, non-pharmacological option for addressing psychological distress in breast cancer patients, promoting a holistic approach to cancer care. Future research should continue to explore the mechanisms underlying the benefits of MBCT and expand its application across different cancer types and stages to fully harness its potential in enhancing the quality of life for cancer patients.

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Declaration of Interest

The authors of this article declared no conflict of interest.

Ethical Considerations

The study protocol adhered to the principles outlined in the Helsinki Declaration, which provides guidelines for ethical research involving human participants. The study was approved by the Ethics Committee of Mazandaran University of Medical Sciences (Ethics code: IR.MAZUMS.REC.1397.2990). Informed consent was obtained from all participants, ensuring they were aware of the study's purpose, procedures, potential risks, and benefits. Confidentiality was maintained throughout the research process, with data anonymized and stored securely.

Transparency of Data

In accordance with the principles of transparency and open research, we declare that all data and materials used in this study are available upon request.

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Authors' Contributions

All authors equally contributed to this study.

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