Comparison of the Effectiveness of Mindfulness-Based Cognitive Therapy and Acceptance and Commitment Therapy on Pain Anxiety and Self-Compassion in Patients with Breast Cancer in the City of Sari

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A B S T R A C T

Purpose: The present study was conducted with the aim of comparing the effectiveness of Mindfulness-Based Cognitive Therapy (MBCT) and Acceptance and Commitment Therapy (ACT) on pain anxiety and self-compassion in patients with breast cancer in the city of Sari.

Methods and Materials: The research method was quasi-experimental using a pretest–posttest design with a control group and a three-month follow-up. The statistical population included all women with breast cancer who referred to the Comprehensive Oncology Centers of Imam Khomeini Hospital in Sari in 2025. From this population, 45 individuals were selected through convenience sampling and randomly assigned to two experimental groups and one control group (15 participants in each group). MBCT and ACT sessions were delivered individually in eight 90-minute sessions, once per week. Participants completed the Pain Anxiety Questionnaire developed by McCracken and Dhingra (2002) and the Self-Compassion Scale by Shahabi et al. (2020) during the pretest, posttest, and follow-up stages. The data were analyzed using repeated-measures analysis of variance and Bonferroni post-hoc tests.

Findings: The results showed that both MBCT and ACT, compared to the control group, led to improvements in pain anxiety and self-compassion in patients with breast cancer, and this effect remained stable at follow-up (p < .001). However, MBCT was more effective than ACT in significantly increasing self-compassion. In contrast, the difference between the two therapeutic approaches in reducing pain anxiety was not significant (p > .05).

Conclusion: According to the findings, MBCT is an effective method for improving self-compassion. However, the effectiveness of the two therapies on pain anxiety was similar. Therefore, these treatments can be considered complementary interventions alongside pharmacological approaches to improve the psychological well-being of these patients.

Keywords: *mindfulness-based cognitive therapy, pain anxiety, self-compassion, breast cancer*

1. Introduction

Breast cancer remains one of the most common malignancies among women worldwide and is associated with high rates of morbidity and mortality, with diagnosis often experienced as a profound biographical disruption that affects identity, relationships, and future orientation (Graham, 2024; Sung et al., 2021). Beyond the biomedical burden of surgery, chemotherapy, radiotherapy, and long-term endocrine treatments, patients frequently face complex psychological consequences such as anxiety, fear of recurrence, depression, and existential distress (Faraji et al., 2023; Reich et al., 2017). Recent reviews emphasize that the consequences of breast cancer extend into social functioning, body image, sexuality, and economic and family roles, requiring multifaceted coping strategies that go beyond purely medical management (Kasgri et al., 2024). Evidence suggests that untreated psychological distress worsens quality of life, undermines adherence to treatment, and may interfere with symptom management, particularly in the domain of pain and fatigue (Park et al., 2020; Zhang et al., 2019). Consequently, there is a growing emphasis on integrating evidence-based psychosocial interventions into standard oncology care for women with breast cancer (Štánerová et al., 2025; Zimmermann et al., 2018).

Pain is a central and often chronic stressor in the cancer trajectory, and contemporary models conceptualize pain as a complex biopsychosocial phenomenon shaped by sensory, emotional, and cognitive processes (Sluka & George, 2021). Fear of pain and pain-related anxiety have been identified as critical determinants of pain experience, disability, and avoidance behavior in both chronic pain and oncological populations (Asmundson et al., 2004; Coons, 2020). Pain anxiety refers to the tendency to respond with excessive worry, hypervigilance, catastrophic thinking, and avoidance in the face of actual or anticipated pain, and is linked to heightened physiological arousal and maladaptive coping strategies (Faryabi et al., 2021; Parvizifard et al., 2022). In breast cancer, pain may arise from tumor burden, treatment complications, neuropathic processes, or musculoskeletal strain, and high levels of pain anxiety can amplify symptom perception and interfere with daily functioning (Cillessen & et al., 2019; Diez et al., 2022). Studies on patients with migraine, low back pain, and fibromyalgia show that elevated pain anxiety is associated with greater disability, emotional distress, and health care utilization, underscoring the need for psychological interventions that directly target

this construct (Dai et al., 2023; Diez et al., 2022; Eidah et al., 2022).

In parallel, the construct of self-empathy and self-compassion has gained increasing attention as a protective factor for emotional adjustment in the face of illness-related stressors. Self-empathy is generally defined as an individual's ability to adopt an accepting, curious, and emotionally responsive stance toward their own internal experiences, especially suffering and vulnerability (Costa & da Rosa, 2022). It is conceptually related to self-compassion, which involves self-kindness, mindful awareness, and recognition of common humanity in moments of difficulty, and is associated with better emotion regulation, reduced shame, and greater psychological well-being (Nolan, 2022; Shahabi et al., 2021). Neuropsychological studies indicate that deficits in affective responsiveness and empathy can compromise interpersonal functioning and increase the risk of social withdrawal and depression (Sousa et al., 2011). In clinical and non-clinical samples, higher levels of self-empathy and self-compassion are linked to more adaptive coping, reduced emotional reactivity, and healthier interpersonal boundaries (Gates & Curwood, 2023; Ma'navipour et al., 2020). Research in Iranian contexts has further shown that self-empathy is systematically related to self-compassion and can be reliably measured, highlighting its relevance as a target for psychological interventions (Ma'navipour et al., 2020; Shahabi et al., 2021). In couples and community samples, higher levels of empathy and compassion also predict better relational functioning, forgiveness, and prosocial behavior, which may be especially important for women with cancer who rely heavily on family and social support (Mohammadian et al., 2021; Rahmani et al., 2024; Showani et al., 2023).

Women with breast cancer constitute a high-risk group for anxiety, including health-related and pain-related anxiety, due to the cumulative impact of diagnosis, invasive treatments, uncertainty about prognosis, and changes in body image and social roles (Graham, 2024; Kasgri et al., 2024). Anxiety in vulnerable populations has been shown to intensify under stressful conditions, such as pandemics, economic crises, or prolonged isolation, suggesting that broader contextual factors can exacerbate existing emotional vulnerabilities in medically ill groups (Yildirim et al., 2021). In cancer patients, acceptance-based and mindfulness-based approaches have emerged as promising methods for reducing psychological distress, including fear of cancer recurrence, fatigue, and mood symptoms (Park et al., 2020; Reich et al., 2017). Meta-analytic evidence indicates that

Acceptance and Commitment Therapy (ACT) and other acceptance-based interventions can reduce anxiety, depression, and psychological inflexibility among individuals with cancer and other chronic illnesses (Li et al., 2021; Zhao et al., 2021). At the same time, empirical and meta-analytic work suggests that interventions grounded in mindfulness and compassion can enhance empathy and self-compassion, thereby improving emotion regulation and relational functioning (Chen et al., 2020; Costa & da Rosa, 2022; Hu et al., 2022).

Mindfulness-based interventions are designed to cultivate nonjudgmental, present-moment awareness of internal and external experiences, and are supported by converging evidence from neuroscience, clinical trials, and meta-analytic syntheses. Neuroimaging studies show that long-term meditation practice is associated with functional and structural changes in brain regions involved in interoception, emotion regulation, and anticipation of pain (Brown & Jones, 2010; Fox et al., 2014). Experimental work indicates that mindfulness practice can reduce negative appraisal of pain and modify anticipatory neural responses, thereby modulating the experience of pain and pain-related anxiety (Brown & Jones, 2010; Emmert et al., 2017). Mindfulness-Based Cognitive Therapy (MBCT), originally developed to prevent depressive relapse, integrates mindfulness training with cognitive-behavioral elements such as decentering and cognitive flexibility (Segal et al., 2002; Sipe & Eisendrath, 2012). Over the past decade, MBCT has been adapted for oncology settings and tested in patients with breast and other cancers, showing benefits for depressive symptoms, anxiety, fear of cancer recurrence, and quality of life (Cillessen & et al., 2019; Park et al., 2020; Zimmermann et al., 2018). Systematic reviews and meta-analyses of mindfulness-based interventions in cancer populations report moderate improvements in psychological well-being, including mood, stress, and symptom burden (Štánerová et al., 2025; Zhang et al., 2019; Zimmermann et al., 2018).

Specifically in breast cancer, several randomized controlled trials and syntheses suggest that MBCT and related mindfulness-based stress reduction (MBSR) protocols can reduce emotional distress and enhance health-related quality of life (Chang et al., 2023; Park et al., 2020; Zhang et al., 2019). A recent systematic review and meta-analysis among women with breast cancer concluded that MBCT has immediate beneficial effects on anxiety, depression, and overall psychological distress, although the evidence base remains limited by heterogeneous samples and methodological variability (Chang et al., 2023). Studies of MBCT in other cancer sites, such as prostate cancer, also show promising effects on vitality and psychological well-being, supporting its broader applicability across oncological conditions (Kudrat Atabayevich et al., 2023). In addition, research on clinical trainees shows that MBCT can increase emotional self-awareness, empathy, and self-compassion, providing indirect support for its potential to enhance self-empathy in clinical populations (Amini Far et al., 2022). Beyond cancer, mindfulness-based interventions have demonstrated benefits for inflammation, pain, and emotional functioning in chronic pain conditions, indicating potential mechanisms relevant for breast cancer–related pain anxiety (Diez et al., 2022; Hu et al., 2022).

Acceptance and Commitment Therapy (ACT), one of the leading "third-wave" cognitive–behavioral approaches, emphasizes psychological flexibility through processes such as acceptance, cognitive defusion, self-as-context, contact with the present moment, values clarification, and committed action (Harris, 2007). Rather than attempting to eliminate distressing thoughts and feelings, ACT aims to change the individual's relationship with internal experiences, thereby reducing experiential avoidance and promoting value-consistent behavior. In oncology, ACT-based interventions have been used to address anxiety, depression, fear of cancer recurrence, and existential concerns, with increasing empirical support (Jiang et al., 2024; Li et al., 2021; Zhao et al., 2021). Meta-analyses show that ACT improves psychological flexibility, fatigue, sleep disturbance, and quality of life in cancer patients, including those undergoing active treatment and survivors (Zhang et al., 2023). In advanced cancer, ACT has been found to reduce psychological distress and enhance well-being, corroborating its relevance for populations facing progressive or life-limiting disease (Fang et al., 2023). Digital and technology-assisted ACT protocols have also demonstrated long-term effectiveness in chronic pain conditions such as fibromyalgia, suggesting that ACT may be especially suitable for pain-related anxiety and coping (Dai et al., 2023).

Evidence comparing ACT and mindfulness-based approaches in non-oncological samples suggests that both can improve emotion regulation, flexibility, and self-control, but their relative strengths may differ across outcomes. Comparative studies in adolescents with self-harming behaviors indicate that ACT and mindfulness-based interventions can both enhance emotional regulation, though the pattern of change may vary across specific facets of emotional functioning (Kamarati et al., 2022). Research on

women with shopping addiction has shown that ACT and MBCT both increase self-control and emotional flexibility, highlighting their shared focus on cognitive and emotional decentering (Danesh Mir Kahn et al., 2021). In pain and migraine populations, ACT and MBCT have each demonstrated efficacy in reducing pain anxiety and improving pain coping, with some findings suggesting that mindfulness components may have particularly strong effects on attentional and appraisal processes related to pain (Diez et al., 2022; Eidah et al., 2022). Studies in cancer and chronic illness also show that ACT can enhance empathy, interpersonal relationships, and prosocial tendencies, especially when combined with explicit compassion-focused or relational exercises (Abd Alrazaq et al., 2023; Rahmani et al., 2024; Showani et al., 2023).

At the same time, accumulating evidence links mindfulness training and MBCT specifically to improvements in empathy, compassion, and prosociality. Meta-analytic work indicates that mindfulness-based interventions can significantly increase empathy, although the magnitude and consistency of effects vary across studies and populations (Hu et al., 2022; Kreplin et al., 2018). Investigations of meditation practitioners reveal that contemplative practice may alter brain structure and function in networks associated with self-referential processing and social cognition, which could underlie changes in empathy and self-compassion (Emmert et al., 2017; Fox et al., 2014). In organizational and family contexts, mindfulness has been found to foster empathic concern, reduce interpersonal conflict, and improve work–family outcomes, suggesting that it may enhance relational capacities that support adjustment to serious illness (Chen et al., 2020; Gates & Curwood, 2023). In Iranian samples, studies have shown that MBCT and ACT can improve quality of life, self-efficacy, and emotion regulation among patients with chronic diseases such as multiple sclerosis and cancer, pointing to their cultural and clinical relevance in local health care settings (Faryabi et al., 2021; Hasami et al., 2025). Recent reviews also highlight that cancer patients' coping strategies, including acceptance and mindfulness, are key determinants of their ability to adjust to the multifaceted consequences of the disease (Kasgri et al., 2024).

Despite the growing body of research on ACT and MBCT in oncology and chronic pain, several gaps remain. First, many studies examine global distress, depression, or quality of life as primary outcomes, with relatively fewer trials focusing specifically on pain anxiety as a distinct construct in women with breast cancer (Cillessen & et al., 2019; Li et al., 2021; Zhao et al., 2021). Second, self-compassion and self-empathy, though theoretically central to how patients relate to their own suffering, have rarely been examined as primary endpoints in intervention trials with oncological populations (Costa & da Rosa, 2022; Shahabi et al., 2021). Third, although both MBCT and ACT share common roots in mindfulness and acceptance, head-to-head comparisons in cancer populations are scarce, and there is limited evidence regarding their differential impact on outcomes such as pain anxiety and self-empathy (Danesh Mir Kahn et al., 2021; Hasami et al., 2025; Kamarati et al., 2022). In addition, cultural factors shape emotional expression, pain communication, and help-seeking in women with breast cancer, making it important to test these interventions in specific socio-cultural contexts, including Iranian clinical settings (Kasgri et al., 2024; Manavipour, 2020; Mohammadian et al., 2021). Addressing these gaps can help clinicians select and tailor interventions that optimally target both pain-related cognitions and compassionate self-relating.

Given the high prevalence of pain anxiety and the central role of self-empathy in psychological adaptation among women with breast cancer, as well as the accumulating evidence for both Mindfulness-Based Cognitive Therapy and Acceptance and Commitment Therapy, the present study aimed to compare the effectiveness of MBCT and ACT on pain anxiety and self-compassion in women with breast cancer in Sari.

2.   Methods and Materials

2.1.   Study Design and Participants

The research method was quasi-experimental with a three-group pretest–posttest design and a three-month follow-up, in which two experimental groups and one control group were compared at the pretest and posttest stages.

The statistical population consisted of all women with breast cancer who referred to the Comprehensive Oncology Centers of Imam Khomeini Hospital in Sari during 2024–2025. The sample size, considering the scope of the design and existing limitations in implementing the intended interventions, was determined from patients with breast cancer using G*Power software with a test power of .80, effect size corresponding to an alpha level of .06; the required sample size for each group was calculated to be 15 participants. Therefore, the final sample size consisted of 45 individuals who were selected through purposive non-

random sampling based on the diagnostic criteria of breast cancer confirmed by physician evaluation and patient self-report interview. Participants were randomly assigned to three groups: the Acceptance and Commitment Therapy (ACT) experimental group (Experimental Group 1, 15 participants), the Mindfulness-Based Cognitive Therapy (MBCT) experimental group (Experimental Group 2, 15 participants), and the control group (15 participants).

In this process, 200 questionnaires were distributed in the Comprehensive Oncology Centers of Imam Khomeini Hospital in Sari among individuals willing to complete the questionnaire. Those who simultaneously met the diagnostic criteria and obtained at least the minimum required scores on the present questionnaires (one standard deviation above the mean on pain anxiety and one standard deviation below the mean on self-compassion) were selected as the target participants. Eligible patients signed the informed consent form after agreeing to participate in the study. Participants were then randomly assigned to the two experimental groups and the control group using a random number generator.

Inclusion criteria consisted of: women diagnosed with breast cancer, age range 20–35 years, no previous history of psychological treatment, willingness to participate in the study, minimum education of middle school, and obtaining the minimum required score on the study scales. Exclusion criteria included: being outside the specified age or education range, receiving other treatments, taking psychiatric medications during the study, missing more than two therapy sessions, and unwillingness to continue participation. The following instruments were used for data collection.

As stated earlier, members of all three groups completed the research questionnaires at three stages: pretest, posttest, and three-month follow-up. Meanwhile, the experimental groups received the ACT and MBCT interventions in accordance with the protocols described below, while the control group did not receive any intervention during the study.

To conduct the study, the necessary approval was obtained from the university and the Research Deputy of Islamic Azad University, Sari Branch. After visiting the Comprehensive Oncology Centers of Imam Khomeini Hospital in 2024, patients diagnosed with breast cancer who scored below the mean on the study questionnaires were assessed. Among those meeting the inclusion criteria, 45 individuals were selected and randomly assigned to Experimental Group 1 (ACT), Experimental Group 2 (MBCT), and the control group, each with 15 participants.

Before starting the intervention sessions, participants were assured that their personal information and research-related data would be kept confidential, and ethical considerations such as confidentiality and respect for personal privacy were emphasized. After the researcher explained the study and participants expressed willingness to take part, the initial questionnaires (pretest) were administered among the sample (patients with breast cancer). The intervention was delivered by the researcher.

Participants in Experimental Group 1 received ACT sessions based on the Harris (2007) protocol, and participants in Experimental Group 2 received MBCT sessions following the Segal et al. (2002) protocol. These interventions were conducted in eight 90-minute weekly group sessions. The control group received no intervention. After completing the intervention period, the posttest was administered to all three groups one week following the last session. After collecting and scoring the questionnaires, the data were analyzed, and three months later, a follow-up session was held for each participant to complete the questionnaires again.

2.2. Measures

The Pain Anxiety Scale was developed by McCracken and Dhingra (2002). The short form consists of 20 items and includes four components: cognitive anxiety symptoms, escape and avoidance behavior, fearful appraisal of pain, and physiological anxiety symptoms. The scoring range is 0–100, with response options from 0 (never) to 5 (always). Higher scores indicate greater pain anxiety. The correlation between the total scale and the Beck Depression Inventory was reported as .62. Correlations with physical disability and psychological disability were also examined, with coefficients of .44 and .59, respectively (Strahl et al., 2000). In Iran, the reliability of this scale using Cronbach's alpha was reported as .88 for the total score and between .64 and .87 for the subscales, indicating acceptable reliability. A significant correlation between pain anxiety symptoms and the short form of the Beck Depression Inventory has also been reported.

The Self-Compassion Questionnaire was developed by Shahabi et al. (2020). This 16-item instrument is rated on a 3-point Likert scale ranging from 1 (disagree) to 3 (agree). Higher scores indicate greater self-compassion. The minimum and maximum scores are 16 and 48. Cronbach's alpha reliability coefficient was reported as .89. Exploratory and confirmatory factor analyses showed that the 16 items

measure five factors: body awareness, emotional understanding, introspection, anxiety, and defense mechanisms. This scale, with adequate reliability and construct/content validity, is appropriate for screening individuals' level of self-compassion. Confirmatory and exploratory factor analyses showed that the scale explains 45.41% of the construct using the five factors of body awareness, emotional understanding, introspection, anxiety, and defense mechanisms (Shahabi et al., 2021).

2.3. Intervention

The Acceptance and Commitment Therapy intervention followed the eight-session protocol developed by Harris (2007), delivered weekly in 90-minute sessions. The first session focused on establishing therapeutic rapport, introducing the study objectives, presenting session guidelines, and administering the pretest, followed by participants identifying their personal goals. The second session familiarized participants with the constructs of pain anxiety and self-compassion, including their signs and consequences, and required participants to reflect on the effects of these variables in their personal and social lives. The third session addressed ineffective control strategies, creative helplessness, and the replacement of avoidance-based responses with value-oriented behaviors through experiential metaphors such as "the man in the hole," followed by identifying personal control strategies. The fourth session introduced acceptance and informal mindfulness practices, emphasizing the futility of experiential avoidance, teaching acceptance steps, practicing willingness toward thoughts and emotions, and using metaphors such as the "lie detector," along with weekly mindfulness exercises. The fifth session focused on cognitive defusion, teaching participants to observe thoughts without judgment using metaphors such as the "chessboard" and the "anxiety radio," and encouraging defusion practice during the week. The sixth session introduced the concept of self-as-context, exploring distinctions between roles, content, and the observing self, supported by metaphors such as the "bus driver" and the "willingness thermostat," followed by exercises for sensory awareness and value clarification. The seventh session centered on identifying personal values across major life domains—including family, marriage, friendships, career, education, leisure, spirituality, social life, nature, and health—along with short- and long-term goal setting, strengthening motivation for valued living, and cultivating mindful self-compassion. The eighth session emphasized committed action, behavioral activation based on values, overcoming barriers, consolidating therapeutic gains, reviewing progress, conducting experiential exercises to enhance life engagement, providing a summary of the intervention, gathering participant feedback, administering the posttest, and finalizing the treatment process.

The Mindfulness-Based Cognitive Therapy intervention followed the eight-session group protocol developed by Segal et al. (2002), with each session lasting 90 minutes. The first session introduced the study, established group norms, and included foundational mindfulness practices such as the mindful raisin exercise and the 45-minute body scan, accompanied by daily homework involving mindful engagement in routine activities. The second session focused on recognizing obstacles to mindfulness by engaging participants in exercises that heightened awareness of thoughts and emotions through imagined ambiguous situations, with homework involving the recording of pleasant events. The third session emphasized breath-focused meditation, mindful walking, and awareness of bodily movement, along with homework alternating between breathing/stretching exercises and mindful movement across the week. The fourth session strengthened present-moment awareness through seeing-and-hearing meditations and seated meditation emphasizing bodily sensations, with the "three-minute breathing space" assigned as daily and situational practice. The fifth session expanded the meditation practice to include awareness of thoughts, emotions, and both pleasant and unpleasant experiences, encouraging nonjudgmental acceptance, with guided sitting meditation assigned as homework. The sixth session emphasized cognitive distancing through imagery-based sitting meditation—such as viewing thoughts as images on a screen—and exercises demonstrating that thoughts are mental events rather than facts, accompanied by continued practice of the three-minute breathing space. The seventh session highlighted self-care, integrating awareness of breath, bodily sensations, sounds, and thoughts, linking mood with behavior, and discussing signs of relapse, fear, pain anxiety, and self-compassion, with continued breathing-space practice. The eighth session focused on applying mindfulness skills to daily life through a concluding body scan, review of previous material, and developing a future plan for integrating mindfulness into ongoing life routines, emphasizing generalization beyond the therapy setting.

2.4. Data Analysis

Data analysis was conducted in two parts: descriptive statistics and inferential statistics. Descriptive statistics included measures of central tendency (mean), measures of dispersion (standard deviation), and distribution indices (skewness and kurtosis). Inferential statistics included repeated-measures analysis of variance and Bonferroni post-hoc tests at a significance level of $\alpha = .05$ using SPSS version 24.

3. Findings and Results

In terms of educational level, 13 participants (28.89%) held a high school diploma, 10 participants (22.22%) held an associate degree, 13 participants (28.89%) held a bachelor's degree, and 9 participants (20%) held a master's degree. Regarding marital status, 10 participants (22.22%) were single and 35 participants (77.78%) were married. The mean and standard deviation of participants' age were 31.92 and 3.17 years, respectively.

Table 1

Means and Standard Deviations of Pain Anxiety and Self-Compassion in the Three Study Groups

Variable	Test Stage	Mindfulness-Based Cognitive Therapy M(SD)	Acceptance & Commitment Therapy M(SD)	Control Group M(SD)
Pain Anxiety	Pretest	64.67 (2.74)	64.87 (2.07)	64.47 (2.70)
	Posttest	50.33 (2.02)	51.87 (1.81)	62.47 (1.36)
	Follow-up	50.00 (1.00)	50.93 (2.09)	62.40 (1.40)
Self-Compassion	Pretest	19.47 (2.13)	19.00 (1.60)	18.60 (1.18)
	Posttest	29.33 (1.76)	27.80 (2.11)	19.47 (1.30)
	Follow-up	31.67 (1.84)	29.40 (2.10)	20.27 (1.62)

Table 1 presents the mean and standard deviation of the research variables—pain anxiety and self-compassion—among the three groups of participants: the Mindfulness-Based Cognitive Therapy group, the Acceptance and Commitment Therapy group, and the control group at the pretest, posttest, and follow-up stages.

The Shapiro–Wilk test was used to examine the normality of score distributions for the research variables—pain anxiety and self-compassion—across the three groups (Mindfulness-Based Cognitive Therapy, Acceptance and Commitment Therapy, and the control group). The Shapiro–Wilk statistics for pain anxiety were .915 (p = .162) in the Mindfulness-Based Cognitive Therapy group, .900 (p = .094) in the Acceptance and Commitment Therapy group, and .892 (p = .072) in the control group. For self-compassion, the Shapiro–Wilk values were .916 (p = .163), .910 (p = .134), and .896 (p = .082) for the same respective groups. Since all significance values were greater than .05, none of the distributions deviated significantly from normality. Therefore, the distributions of pain anxiety and self-compassion in all three groups were normal, and the use of parametric tests for data analysis was justified.

To test the assumption of homogeneity of error variances, Levene's test was conducted for pain anxiety and self-compassion across the pretest, posttest, and follow-up assessments. For pain anxiety, Levene's test produced nonsignificant results at the pretest (F = 1.012, p = .372), posttest (F = 1.004, p = .375), and follow-up (F = 3.020, p = .060). For self-compassion, the test also yielded nonsignificant results at the pretest (F = 2.979, p = .062), posttest (F = 1.113, p = .338), and follow-up (F = .227, p = .798). Because all p-values exceeded .05, the assumption of homogeneity of error variances was satisfied for all variables across all assessment points.

The assumption of homogeneity of variance–covariance matrices was examined using Box's M test. The Box's M value was 304.329 with a nonsignificant result (F = 1.117, p = .156). Since the p-value exceeded .05, the homogeneity of the variance–covariance matrices across the groups was confirmed, indicating that the assumption was met.

Mauchly's test of sphericity was used to evaluate the sphericity assumption required for repeated-measures ANOVA. For pain anxiety, Mauchly's test was significant ($\chi^2 = 21.141$, df = 2, p = .001), indicating a violation of sphericity. For self-compassion, however, the test was nonsignificant ($\chi^2 = 3.770$, df = 2, p = .152), meaning that the sphericity assumption was met only for this variable. Because the sphericity assumption was violated for pain anxiety, the Greenhouse–Geisser correction was applied to adjust the F-statistic when analyzing within-subject effects for this variable.

Table 2

Results of Repeated-Measures ANOVA for the Research Variables Across the Three Stages

Variables	Source of Change	Sum of Squares	Mean Square	F Value	Sig.	Effect Size
Pain Anxiety	Time Effect	300.444	2107.440	785.829	.001	.949
	Time × Group Interaction	960.311	336.801	125.587	.001	.857
Self-Compassion	Time Effect	1654.711	900.042	512.857	.001	.924
	Time × Group Interaction	565.111	153.690	87.575	.001	.807

Based on the results in Table 2, the main effect of group on the research variables—pain anxiety and self-compassion—was significant (p < .001). In other words, the overall mean scores of pain anxiety and self-compassion differed significantly among the experimental groups (Mindfulness-Based Cognitive Therapy and Acceptance and Commitment Therapy) and the control group (p < .001). The interaction effect of time and group was also significant (p < .001), indicating that the pattern of change in the mean scores of pain anxiety and self-compassion across the pretest, posttest, and follow-up stages differed significantly among the three groups.

Table 3

Bonferroni Post-Hoc Results for Comparing Mean Scores of the Research Variables Across Assessment Stages

Variable	Stages	Adjusted Mean	Stage Comparison	Mean Difference	Sig.
Pain Anxiety	Pretest	64.667	Pretest–Posttest	9.778	.001
	Posttest	54.889	Pretest–Follow-up	10.222	.001
	Follow-up	54.444	Posttest–Follow-up	0.444	.060
Self-Compassion	Pretest	19.022	Pretest–Posttest	−6.511	.001
	Posttest	25.533	Pretest–Follow-up	−8.089	.001
	Follow-up	27.111	Posttest–Follow-up	−1.578	.001

To determine at which assessment stages the total scores of the dependent variables differed significantly, the Bonferroni post-hoc test was used to compare the means pairwise. Table 3 shows that both interventions (Mindfulness-Based Cognitive Therapy and Acceptance and Commitment Therapy) had a significant effect on the total scores of the dependent variables at both the posttest and follow-up stages.

The results indicate that the "pretest–posttest" and "pretest–follow-up" mean differences were greater for self-compassion and smaller for pain anxiety compared with the "posttest–follow-up" difference. This suggests that both interventions (Mindfulness-Based Cognitive Therapy and Acceptance and Commitment Therapy) significantly affected pain anxiety and self-compassion at the posttest stage, and this significant effect persisted at follow-up.

However, since the results do not reveal which intervention produced the greater effect at the posttest and follow-up stages, or which intervention was more effective overall, the Bonferroni post-hoc test was used for comparing the effectiveness of the intervention groups. These results are presented in Table 4.

Table 4

Bonferroni Results for Identifying the More Effective Treatment

Variable	Group Comparison	Mean Difference	Sig.
Pain Anxiety	MBCT – ACT	−0.889	.433
	MBCT – Control	−8.111	.001
	ACT – Control	−7.222	.001
Self-Compassion	MBCT – ACT	1.422	.029
	MBCT – Control	7.378	.001
	ACT – Control	5.956	.001

The Bonferroni results in Table 4 indicate that significant differences existed between both experimental groups (Mindfulness-Based Cognitive Therapy and Acceptance and Commitment Therapy) and the control group for all research variables—pain anxiety and self-compassion (p < .001). This demonstrates the effectiveness of both MBCT and ACT in reducing pain anxiety and increasing self-compassion among patients with breast cancer in Sari at the posttest stage, as well as the persistence of these effects at follow-up.

Furthermore, no significant difference was found between Mindfulness-Based Cognitive Therapy and Acceptance and Commitment Therapy in reducing pain anxiety (p > .05), indicating that both treatments were equally effective in reducing pain anxiety in this population.

However, a significant difference was found between Mindfulness-Based Cognitive Therapy and Acceptance and Commitment Therapy for self-compassion (p < .05), such that MBCT was significantly more effective than ACT in increasing self-compassion at the posttest stage, and this superior effectiveness of MBCT persisted at follow-up when compared to ACT.

4. Discussion and Conclusion

The purpose of this study was to compare the effectiveness of Mindfulness-Based Cognitive Therapy (MBCT) and Acceptance and Commitment Therapy (ACT) on pain anxiety and self-compassion among women with breast cancer. The findings demonstrated that both intervention approaches significantly reduced pain anxiety and increased self-compassion compared to the control group. Furthermore, these improvements remained stable at the three-month follow-up period. However, while both treatments were equally effective in reducing pain anxiety, MBCT showed a significantly greater effect in increasing self-compassion compared to ACT. This pattern of results provides important insight into the mechanisms of change underlying mindfulness-based and acceptance-based therapies in oncological populations.

The significant reduction in pain anxiety across both treatment groups is consistent with a substantial body of research indicating that psychological interventions targeting acceptance, mindfulness, and cognitive flexibility have beneficial effects on pain-related distress. The conceptualization of pain anxiety as a multidimensional construct involving cognitive, emotional, and physiological components suggests that interventions addressing maladaptive appraisal processes are likely to be beneficial

(Asmundson et al., 2004; Sluka & George, 2021). In the present study, participants receiving ACT likely benefited from the intervention's emphasis on psychological flexibility, acceptance of internal experiences, and reduction in experiential avoidance—all of which are theoretically associated with reducing fear of pain and behavioral avoidance patterns. This finding aligns with previous evidence showing that ACT reduces pain anxiety, emotional distress, and maladaptive coping in chronic pain and oncology populations (Dai et al., 2023; Fang et al., 2023; Faryabi et al., 2021).

Likewise, the MBCT intervention led to substantial reductions in pain anxiety, a finding supported by numerous studies indicating that mindfulness practices modify cognitive appraisal of pain, decrease reactivity to bodily sensations, and reduce catastrophizing (Brown & Jones, 2010; Diez et al., 2022). Theoretical frameworks of mindfulness suggest that training individuals to observe pain sensations with openness and nonjudgment decreases the secondary emotional responses that fuel anxiety. Evidence from randomized controlled trials with cancer patients also shows that mindfulness-based programs reduce physical symptoms, fatigue, and pain-related distress (Cillessen & et al., 2019; Park et al., 2020; Zimmermann et al., 2018). The findings from this study therefore reinforce the broader literature and confirm that both MBCT and ACT constitute effective therapeutic approaches for managing pain anxiety among women with breast cancer.

Despite similarities in their impact on pain anxiety, MBCT demonstrated superior outcomes in enhancing self-compassion. This is consistent with theoretical models positioning mindfulness as a direct pathway to developing nonjudgmental, kind, and accepting attitudes toward oneself. MBCT explicitly cultivates compassion, emotional awareness, and self-directed empathy through structured meditative practices, which may explain its stronger influence on self-compassion compared to ACT. Previous research supports this interpretation: studies show that mindfulness training increases empathy, compassion, and emotional connectedness through enhanced affective regulation and interoceptive awareness (Chen et al., 2020; Costa & da Rosa, 2022; Hu et al., 2022). Neuropsychological evidence likewise links mindfulness practice to neural changes in regions associated with empathy, compassion, and emotional attunement, suggesting that mindfulness fosters deeper emotional resonance with oneself and others (Emmert et al., 2017; Fox et al., 2014).

In contrast, ACT, although correlated with improved interpersonal relationships and emotional functioning, places less explicit emphasis on compassion training and more on values-guided action and acceptance processes. While ACT teaches individuals to adopt an observer perspective toward their internal experiences, it may not provide the same structured cultivation of self-kindness that is central to MBCT. Nevertheless, previous studies have shown that ACT is effective in improving empathy, relational functioning, and self-acceptance (Mohammadian et al., 2021; Rahmani et al., 2024; Showani et al., 2023). The present findings support this literature by demonstrating that ACT significantly increased self-compassion relative to the control group, even if its effect was smaller than MBCT.

The observed results extend the growing body of evidence comparing ACT and MBCT across different psychological populations. Comparative studies indicate that both therapies improve emotional flexibility, cognitive control, and self-regulation, yet their specific mechanisms differ. For instance, research on behavioral addictions shows that ACT and MBCT both enhance emotional flexibility and self-control, but MBCT produces stronger changes in mindfulness and self-awareness (Danesh Mir Kahn et al., 2021). Studies in adolescents with emotional regulation difficulties likewise show that both approaches are effective, though MBCT may yield greater improvements in emotional awareness and cognitive clarity (Kamarati et al., 2022). The findings from this study contribute to this comparative literature by highlighting that MBCT's structured emphasis on mindfulness practice offers unique benefits for self-compassion.

These findings also underscore the significance of self-compassion in the adjustment process of women with breast cancer. Research suggests that self-compassion promotes emotional resilience, lowers distress, reduces shame, and improves overall well-being in populations experiencing trauma, illness, or chronic stress (Nolan, 2022; Shahabi et al., 2021). In the context of breast cancer, where emotional resources are strained by pain, fear of recurrence, and physical changes, enhancing self-compassion may be particularly critical. Self-compassion has also been linked to healthier coping strategies, better interpersonal functioning, and reduced emotional reactivity (Gates & Curwood, 2023; Sousa et al., 2011). By demonstrating that MBCT significantly improves self-compassion, this study suggests that mindfulness-based interventions may facilitate more adaptive emotional adjustment in cancer patients.

The persistence of treatment effects at the three-month follow-up point provides additional support for the long-term benefits of both MBCT and ACT. Prior longitudinal studies have shown that these interventions produce sustained improvements in well-being, psychological flexibility, and emotional regulation even months after treatment has ended (Reich et al., 2017; Zhang et al., 2023). Research with cancer patients indicates that the benefits of MBCT in reducing anxiety, stress, and distress often continue beyond the intervention, likely due to the internalization of mindfulness skills (Park et al., 2020). Similarly, ACT's emphasis on values-aligned behavior change may produce durable improvements because it reshapes the individual's relationship with pain, self-evaluation, and emotional discomfort (Li et al., 2021; Zhao et al., 2021).

It is noteworthy that the present findings align with global research indicating that psychological interventions are essential components of comprehensive cancer care. Studies reporting high rates of anxiety, depression, and fear of recurrence among breast cancer patients underline the importance of integrating evidence-based treatments into standard oncology settings (Graham, 2024; Kasgri et al., 2024). International epidemiological data further confirm that breast cancer disproportionately affects women across diverse cultural contexts, emphasizing the need for culturally adaptable interventions such as MBCT and ACT (Sung et al., 2021). The current study also contributes to the growing literature on Iranian populations, showing that both MBCT and ACT are effective in culturally specific clinical settings, consistent with previous Iranian studies reporting similar benefits in chronic illness, addiction, and emotional dysregulation (Amini Far et al., 2022; Hasami et al., 2025; Manavipour, 2020).

Collectively, the findings highlight the meaningful role that both mindfulness-based and acceptance-based approaches play in improving psychological outcomes among women with breast cancer. They also provide evidence that, although both treatments are effective, MBCT may offer distinct advantages for enhancing self-compassion, a construct closely tied to emotional recovery and psychological well-being. As the literature increasingly supports the integration of psychological approaches into cancer treatment programs, this study underscores the need for accessible, structured, and empirically supported interventions capable of addressing both pain-specific and emotion-regulation difficulties among breast cancer patients.

This study has several limitations that should be acknowledged. The sample size was relatively small, which may limit the generalizability of the findings to broader cancer populations. Participants were selected through convenience sampling, potentially introducing selection bias. The interventions were administered in a controlled clinical setting, which may not reflect naturalistic treatment environments. Additionally, self-report measures were used to assess pain anxiety and self-compassion, which may be subject to reporting biases. Moreover, the follow-up period was limited to three months, and longer-term outcomes remain unknown. Finally, the study did not evaluate potential moderating variables such as disease stage, treatment type, or social support, which may influence intervention effectiveness.

Future studies should consider larger and more diverse samples to improve generalizability and explore potential moderators such as cultural factors, treatment status, and illness severity. It would be beneficial to include objective physiological or behavioral measures in addition to self-report assessments. Long-term follow-up periods are recommended to determine the durability of treatment effects beyond three months. Comparative studies could also explore whether integrating components of MBCT and ACT produces additive or synergistic effects. Additionally, future research should examine mediators that explain how these interventions reduce pain anxiety and increase self-compassion, such as cognitive flexibility, mindfulness facets, or experiential acceptance.

Clinicians working with breast cancer patients should consider incorporating both mindfulness-based and acceptance-based interventions as complementary tools to medical treatment. Providing structured MBCT sessions may be particularly helpful for patients struggling with self-criticism or emotional distress, while ACT may be beneficial for those who experience significant avoidance or difficulty engaging with their values. Integrating these interventions into oncology clinics can enhance emotional well-being, reduce pain-related distress, and support patients in developing adaptive coping strategies throughout the cancer treatment trajectory.

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.

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