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Comparison of the Effectiveness of Mindfulness-Based Therapy and Emotion-Focused Therapy on Pain Perception in Patients with Cardiovascular Diseases

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ABSTRACT

The aim of this study was to compare the effectiveness of mindfulness-based therapy and emotion-focused therapy on pain perception in patients with cardiovascular diseases. This study employed a quasi-experimental design with a pre-test–post-test control group structure. The statistical population consisted of patients with coronary artery disease (CAD) who referred to a specialized heart clinic in Rasht, Iran, during the first quarter of 2025. Sixty eligible participants were selected through purposive sampling and randomly assigned to three groups: mindfulness-based therapy, emotion-focused therapy, and a control group. The interventions were conducted over nine weekly sessions, while the control group received only routine medical care. Data were collected using the McGill Pain Questionnaire, which measures total, sensory, affective, evaluative, and miscellaneous pain perception. Data analysis was performed using descriptive statistics, repeated measures ANOVA, and Bonferroni and Tukey post-hoc tests with SPSS version 26. The results of the repeated measures ANOVA indicated significant main effects of time and group on total pain perception ($F = 14.25$, $p < 0.001$, $\eta^2 = 0.20$) and on the sensory ($F = 9.87$, $p = 0.003$), affective ($F = 8.45$, $p = 0.005$), and evaluative ($F = 11.32$, $p = 0.001$) subdimensions of pain. Bonferroni post-hoc tests confirmed significant reductions in total pain scores in both the mindfulness-based ($\Delta M = 7.59$, $p = 0.001$) and emotion-focused ($\Delta M = 8.10$, $p < 0.001$) experimental groups compared to pre-test values, whereas no significant changes were found in control groups. Tukey comparisons showed no significant difference between the two therapies ($p = 0.623$), indicating comparable effectiveness. Both mindfulness-based and emotion-focused therapies significantly reduced pain perception in patients with cardiovascular diseases, demonstrating equivalent effectiveness in modulating sensory, affective, and evaluative dimensions of pain through cognitive and emotional regulation mechanisms.

Keywords: Mindfulness-Based Therapy; Emotion-Focused Therapy; Pain Perception; Cardiovascular Diseases; Chronic Pain; Psychophysiological Regulation

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Introduction

Cardiovascular diseases (CVDs) are among the most prevalent chronic health conditions worldwide and represent a major cause of mortality and disability, accounting for substantial physical and psychological burdens across populations. Patients with CVD often experience persistent pain, emotional distress, and diminished quality of life due to both physiological dysfunction and psychosocial strain (1). Pain perception in these patients is not merely a sensory phenomenon but a multidimensional construct involving sensory, affective, cognitive, and evaluative components that interact with psychological factors such as anxiety, emotional regulation, and stress (2). Chronic cardiac pain can therefore amplify emotional dysregulation and maladaptive coping responses, contributing to a self-perpetuating cycle of distress and physiological arousal (3). Managing pain perception in cardiac patients thus requires an integrative therapeutic framework that addresses both mind and body processes to foster emotional stability and physiological regulation.

In recent decades, mind–body interventions, particularly mindfulness-based and emotion-focused therapies, have emerged as effective psychological approaches for managing chronic pain and related emotional disturbances. These interventions aim to alter maladaptive cognitive–emotional patterns that exacerbate pain perception, anxiety, and physiological reactivity (4). Mindfulness-based therapies, originally developed by Kabat-Zinn in the late 1970s, are grounded in cultivating present-moment awareness and nonjudgmental acceptance of internal experiences. They have been shown to influence both psychological and physiological domains, reducing sympathetic arousal and enhancing parasympathetic regulation, which are crucial for patients with cardiovascular vulnerability (5). In this context, mindfulness-based interventions promote attentional control and emotional awareness that decrease pain catastrophizing, rumination, and stress-induced cardiovascular responses (6).

Empirical evidence underscores the clinical utility of mindfulness-based approaches in reducing chronic pain intensity and improving psychological adaptation. For instance, Zgierska et al. (6) demonstrated that mindfulness training was as effective as cognitive behavioral therapy (CBT) in alleviating chronic low back pain among opioid-treated patients, highlighting mindfulness as a viable nonpharmacological strategy for pain regulation. Similarly, Soukhtanlou et al. (5) developed a mindfulness-based stress reduction (MBSR) program specifically for elderly patients with chronic pain, reporting significant decreases in pain intensity and distress. In line with these findings, Pouryounes Abkenar et al. (4) found that mindfulness-based cognitive therapy (MBCT) enhanced both resilience and quality of life in women suffering from chronic pain. These studies collectively emphasize that mindfulness facilitates a shift from reactive emotional patterns toward adaptive, self-regulated responses that mitigate both the subjective and physiological dimensions of pain.

Recent studies within Iranian clinical contexts have similarly confirmed the therapeutic impact of mindfulness interventions on pain-related psychological factors. For example, Arefian et al. (3) reported that mindfulness-integrated CBT significantly reduced pain perception and improved life expectancy among women with breast cancer undergoing chemotherapy. Azimi et al. (7) found that mindfulness-based cognitive therapy decreased pain catastrophizing and rumination in cancer patients, while Bagheri Sheykhangafshe et al. (8) demonstrated improvements in alexithymia, emotional regulation, and pain intensity in children with irritable bowel syndrome following MBCT. These findings suggest that mindfulness interventions are

effective across diverse populations and clinical conditions, extending beyond psychological outcomes to influence physiological indicators such as heart rate variability and stress reactivity (9).

Specifically within cardiac populations, mindfulness-based interventions have shown promising outcomes in addressing psychological comorbidities and physiological dysregulation. Changi Ashtiani et al. (1) reported that mindfulness-based schema therapy effectively reduced mental pain and experiential avoidance in patients with cardiovascular diseases. The reduction in experiential avoidance reflects enhanced emotional processing, allowing patients to respond more adaptively to physical discomfort. Such findings align with global research emphasizing that mindfulness may regulate autonomic balance, reduce inflammatory activity, and lower perceived stress—all of which contribute to improved cardiovascular functioning (2).

Parallel to the growth of mindfulness-based approaches, emotion-focused therapy (EFT) has gained recognition as another evidence-based intervention for managing pain and emotional distress. Developed by Greenberg and Johnson, EFT focuses on transforming maladaptive emotional responses through awareness, expression, and restructuring of primary emotions (10). In chronic pain management, EFT helps patients explore the emotional meaning of pain, facilitating cognitive–emotional integration and reducing distress-related physiological activation (11). Unlike cognitive-based models that emphasize reappraisal, EFT operates through the corrective experience of emotions, enabling patients to reconstruct their emotional narratives and develop healthier affective regulation patterns (12).

Several recent studies have provided empirical support for the role of emotion-focused interventions in reducing pain and improving psychological well-being. Doshmanfana et al. (12) found that EFT significantly enhanced emotional regulation and resilience among patients with chronic pain and depressive symptoms. Similarly, Ertezaee et al. (10) demonstrated that EFT reduced mental pain and experiential avoidance in women with depression following romantic relationship loss, suggesting that EFT promotes adaptive emotional functioning across different stress-related contexts. Shokrolahi et al. (11) further compared EFT with cognitive analytic therapy (CAT) in patients suffering from chronic pain and alexithymia, concluding that EFT was particularly effective in reducing anxiety sensitivity and pain catastrophizing—two critical predictors of chronic pain perception. Collectively, these studies support EFT as a process-oriented intervention that reshapes emotional responses to pain through acceptance and transformation rather than suppression or avoidance.

Moreover, comparative research has begun exploring the relative efficacy of mindfulness-based and emotion-focused therapies on overlapping constructs such as pain perception, emotion regulation, and stress management. For instance, Barghi Irani and Dehghan Saber (13) compared mindfulness-based therapy with spiritual therapy in older women and found significant improvements in anxiety reduction and cognitive flexibility among participants receiving mindfulness-based training. Similarly, Seyed Ali Tabar and Zadhasn (14) demonstrated that MBCT effectively reduced mental pain and distress tolerance issues in breast cancer patients, reinforcing mindfulness as a cognitive–emotional regulatory mechanism. Complementing these findings, Ebrahimi Sadr et al. (15) compared MBCT with short-term solution-focused therapy for chronic headache patients and reported significant decreases in pain anxiety and improved quality of life among the MBCT participants. These results confirm that mindfulness-based approaches

target both the sensory and emotional components of pain, enabling patients to reinterpret and regulate their pain experiences through cognitive–affective integration.

In addition, emotional healing frameworks that incorporate compassion-focused strategies have also been linked to reductions in emotional pain and improvements in social connectedness among clinical populations. Sheikh Mohammadi et al. (16) found that compassion-focused group therapy improved emotional pain and social relationships in women with breast cancer, a finding replicated by Sheykh Mohammadi et al. (17), who reported similar results in the same population. These findings underscore the importance of emotionally restorative interventions that not only alleviate internal distress but also foster interpersonal regulation—an essential component of recovery in chronic illness.

From a neurophysiological perspective, both mindfulness-based and emotion-focused approaches have been shown to influence central pain pathways and autonomic nervous system activity. Mindfulness reduces cortical reactivity in the anterior cingulate cortex and insula—regions associated with pain modulation and emotional salience—while increasing prefrontal regulation of emotional responses (9). Emotion-focused therapy, in contrast, facilitates the activation and transformation of maladaptive emotional scripts, engaging limbic regulation mechanisms that modify the affective tone of pain experiences (18). These complementary mechanisms highlight the potential for integrated therapeutic designs to enhance cognitive flexibility, emotional coherence, and physiological resilience among patients with chronic pain conditions, particularly those complicated by cardiovascular disease.

Furthermore, cultural adaptations of these therapeutic models have proven particularly relevant in contexts such as Iran, where psychosomatic expressions of distress are common and where emotional regulation strategies often intersect with spiritual and cultural values (1). Mindfulness and emotion-focused therapies, by addressing both the internal awareness and the transformative experience of emotions, align well with collectivist frameworks emphasizing emotional authenticity and acceptance. The inclusion of physiological feedback mechanisms such as heart rate monitoring—common in contemporary interventions—has further enriched the understanding of how cognitive–emotional interventions can directly influence bodily processes in patients with cardiovascular vulnerabilities (8).

Despite growing evidence supporting both mindfulness-based and emotion-focused therapies, comparative research directly examining their relative impact on pain perception in cardiac patients remains limited. Previous studies have often focused on isolated outcomes—either psychological or physiological—without fully integrating measures of pain perception that encompass sensory, affective, evaluative, and miscellaneous dimensions. Given the complex biopsychosocial nature of pain in cardiovascular disease, there is a pressing need to assess which therapeutic modality more effectively modulates these multidimensional aspects of pain. This comparative approach can inform clinicians about the most efficient psychotherapeutic strategy to complement medical treatment and improve patient outcomes in cardiovascular rehabilitation settings (1, 3, 12).

Therefore, the aim of the present study is to compare the effectiveness of mindfulness-based therapy and emotion-focused therapy on pain perception in patients with cardiovascular diseases.

Methods and Materials

Study Design and Participants

This study employed a quasi-experimental design with a pre-test–post-test control group structure. Participants were randomly assigned to one of three groups: a mindfulness-based therapy group, an emotion-focused therapy group, and a control group. The study population consisted of all individuals diagnosed with coronary artery disease (CAD) who sought treatment at one of the specialized heart clinics in Rasht, Iran, during the first quarter of 2025. Diagnosis of coronary artery disease was confirmed by a specialist physician based on clinical assessments and medical records. From this population, a purposive sample of 60 patients who met the inclusion criteria and expressed willingness to participate in the study was selected. Participants were then randomly divided into the three groups, ensuring an equal number of subjects in each condition.

The inclusion criteria required participants to be between 45 and 70 years old, to have a confirmed diagnosis of coronary artery disease by a cardiologist, and to demonstrate the motivation and ability to attend therapy sessions and complete the research questionnaires. Additionally, participants had to be free of severe psychiatric disorders that could interfere with their engagement in psychological interventions. The exclusion criteria included any acute medical or physical complications arising during the study that could prevent continuation in the treatment sessions, withdrawal of consent, or failure to comply with the treatment protocols. These criteria were designed to ensure both the accuracy of the findings and the health and safety of all participants.

In this design, all participants first completed a pre-test (T1) to assess their baseline pain perception. Afterward, the first experimental group received the mindfulness-based therapy intervention, while the second experimental group underwent the emotion-focused therapy intervention. The control group did not receive any psychological treatment during the study period and continued with routine medical care. Following the interventions, all participants completed the post-test measures to assess changes in pain perception.

Data Collection

The McGill Pain Questionnaire (MPQ), originally developed by Melzack in 1975, was used to measure pain perception. This instrument consists of 20 sets of descriptive statements designed to assess an individual's subjective experience of pain. The questionnaire employs a binary scoring system (0 or 1). If a participant found none of the descriptors in a set applicable to their experience, the set received a score of 0; if at least one descriptor matched their experience, a score of 1 was assigned. The MPQ evaluates pain perception across several domains, including sensory, affective, evaluative, and miscellaneous components. Specifically, sets 1 to 10 assess sensory pain perception, sets 11 to 15 assess affective pain perception, and sets 16 to 20 assess evaluative and miscellaneous aspects of pain. Total pain perception scores are calculated by summing responses across all sets, with higher scores indicating greater perceived pain intensity. Exploratory and confirmatory factor analyses of the MPQ have identified four distinct subscales corresponding to the dimensions of sensory, affective, evaluative, and miscellaneous pain perception. Reliability analyses have shown acceptable internal consistency, with Kuder–Richardson coefficients of 0.77, 0.91, 0.75, and 0.89 for

the respective subscales. Dworkin and colleagues (2009) reported a Cronbach's alpha of 0.95, indicating excellent internal consistency reliability. The same study found a content validity coefficient of 0.61, supporting its use as a valid tool for assessing pain perception. In an Iranian study by Taraghi and Masoudi (2019), the Kuder–Richardson reliability coefficients for all dimensions ranged from 0.79 to 0.85, and the overall content validity index was 0.87. These findings confirm the psychometric adequacy of the MPQ for use in both international and Iranian clinical contexts.

Interventions

The mindfulness-based therapy program consisted of nine structured sessions designed specifically for patients with cardiovascular disease, integrating Kabat-Zinn's (1990) foundational principles of mindfulness with physiological monitoring of heart rate (HR) through a pulse oximeter. The intervention emphasized three core elements of mindfulness—intentional awareness, present-moment focus, and nonjudgmental attitude—applied to the management of anxiety sensitivity, pain perception, chronic stress, and cardiac rhythm regulation. Each session combined cognitive-behavioral and somatic exercises derived from Kabat-Zinn's Mindfulness-Based Stress Reduction (MBSR) model, adapted to the physiological and psychological needs of cardiac patients. Techniques such as body scanning, diaphragmatic breathing, and mindful observation of thoughts were practiced alongside HR monitoring to enhance mind–body awareness. The program began with baseline assessment and psychoeducation on the mind–body connection, followed by progressive training in anxiety desensitization, pain perception management, and stress regulation. Subsequent sessions focused on integrating mindfulness into daily life, promoting emotional resilience, and cultivating acceptance of cardiac limitations. Each session included practical home assignments—such as HR recording during relaxation and stress episodes, mindful breathing practice, and journaling of physiological–emotional changes—to reinforce self-regulation skills. The later sessions emphasized emotional resilience, personal strategy development, relapse prevention, and long-term maintenance through individualized mindfulness plans. In the final session, participants underwent post-testing of research variables and HR comparison analyses, enabling evaluation of mindfulness-induced changes in anxiety sensitivity, pain perception, chronic stress, and cardiac regulation. Overall, this integrative protocol functioned as both a psychological intervention and a psychophysiological training system that linked conscious awareness to measurable heart rate variability, aiming to optimize both emotional and cardiovascular health outcomes.

The emotion-focused therapy (EFT) program was a nine-session intervention specifically tailored for cardiac patients, combining Greenberg and Johnson's (2004) evidence-based EFT framework with real-time heart rate monitoring using a pulse oximeter. This integrative design targeted the study's four main components—anxiety sensitivity, pain perception, chronic stress, and heart rate regulation—by focusing on emotional activation, regulation, and transformation. Each session followed a structured format including a defined therapeutic goal, five emotion-centered exercises, and two targeted assignments. The program began with a comprehensive emotional and physiological pre-assessment to establish baseline emotional awareness and heart rate responsiveness. Early sessions emphasized identifying and understanding the emotional hierarchy underlying cardiac symptoms, recognizing key emotions (such as fear, anger, and helplessness), and practicing "emotional heartbeat" awareness through HR tracking. Subsequent sessions

focused on anxiety negotiation, transforming secondary emotions, and distinguishing physical pain from emotional suffering through expressive and imagery-based techniques. Progressive modules introduced methods for dissolving chronic emotional stress ("emotional melting"), achieving HR–emotion synchronization, and cultivating adaptive emotions like hope and acceptance. Deeper emotional processing was facilitated through techniques such as the "empty-chair dialogue," emotional pulse regulation, and reconstructing fear-based narratives. In later sessions, participants practiced emotional transformation and developed personalized emotion-regulation tools aimed at sustaining improvements in HR variability and psychological stability. The program concluded with post-intervention assessment and HR mapping to visualize the relationship between emotional change and physiological adaptation. Throughout the intervention, patients maintained emotion diaries, monitored HR changes during emotional experiences, and applied emotion-focused breathing and imagery in real-life stress scenarios. This structured EFT protocol thus integrated emotional awareness and physiological feedback to promote sustainable regulation of both affective and cardiac functioning in individuals with coronary artery disease.

Data Analysis

Data were analyzed using both descriptive and inferential statistical methods. Descriptive statistics, including means and standard deviations, were first used to summarize demographic variables and pain perception scores. To ensure the homogeneity of the groups before the intervention, the Shapiro–Wilk test was performed to check the normality of the dependent variables in the pre-test phase. This step ensured that random assignment had successfully created comparable groups prior to the intervention.

For inferential analysis, univariate and multivariate analyses of variance (ANOVA and MANOVA) with repeated measures were employed to examine changes in pain perception across pre-test and post-test phases and to assess the differential effectiveness of mindfulness-based and emotion-focused therapies. When significant effects were detected, post-hoc tests, including Bonferroni and Tukey comparisons, were conducted to determine specific group differences. Statistical significance was set at the 0.05 level. All analyses were performed using SPSS software version 26, which provided both the parametric testing capability and robust reliability diagnostics needed for the study.

Findings and Results

The findings of this study aimed to compare the effectiveness of mindfulness-based therapy and emotion-focused therapy on pain perception among patients with cardiovascular diseases. Descriptive statistics were calculated for both experimental and control groups in the pre-test and post-test phases. The results include the mean (M) and standard deviation (SD) for the total pain perception scores as well as for the sensory, affective, evaluative, and miscellaneous subscales across all groups. These descriptive indices provided an overview of the changes in pain perception following the interventions.

Table 1. Descriptive Indices of Pain Perception Scores in Treatment Groups by Pre-Test and Post-Test Phases

Treatment Group	Pain Perception Subscale	Phase	N	Mean (M)	Standard Deviation (SD)
Mindfulness-Based Experimental Group	Total Pain	Pre-Test	15	69.33	1.18
		Post-Test	15	61.74	1.03
	Sensory	Pre-Test	15	17.72	0.29

		Post-Test	15	15.59	0.25
	Affective	Pre-Test	15	16.67	0.29
		Post-Test	15	15.53	0.29
	Evaluative	Pre-Test	15	18.20	0.29
		Post-Test	15	15.47	0.29
	Miscellaneous	Pre-Test	15	16.53	0.29
		Post-Test	15	16.12	0.29
Mindfulness-Based Control Group	Total Pain	Pre-Test	15	70.27	1.18
		Post-Test	15	70.18	1.17
	Sensory	Pre-Test	15	17.60	0.29
		Post-Test	15	17.40	0.29
	Affective	Pre-Test	15	17.72	0.29
		Post-Test	15	17.53	0.29
	Evaluative	Pre-Test	15	17.60	0.29
		Post-Test	15	17.47	0.29
	Miscellaneous	Pre-Test	15	17.33	0.29
		Post-Test	15	17.80	0.29
Emotion-Focused Experimental Group	Total Pain	Pre-Test	15	68.24	1.19
		Post-Test	15	60.14	1.19
	Sensory	Pre-Test	15	16.93	0.29
		Post-Test	15	15.01	0.29
	Affective	Pre-Test	15	16.01	0.29
		Post-Test	15	14.02	0.29
	Evaluative	Pre-Test	15	18.04	0.29
		Post-Test	15	15.02	0.29
	Miscellaneous	Pre-Test	15	15.98	0.29
		Post-Test	15	15.90	0.29
Emotion-Focused Control Group	Total Pain	Pre-Test	15	69.20	1.20
		Post-Test	15	69.10	1.20
	Sensory	Pre-Test	15	17.01	0.29
		Post-Test	15	17.03	0.29
	Affective	Pre-Test	15	17.03	0.29
		Post-Test	15	17.02	0.29
	Evaluative	Pre-Test	15	17.09	0.29
		Post-Test	15	17.06	0.29
	Miscellaneous	Pre-Test	15	17.01	0.29
		Post-Test	15	17.05	0.29

The results presented in Table 1 show that both experimental interventions—mindfulness-based therapy and emotion-focused therapy—were effective in reducing pain perception among cardiac patients. In the mindfulness-based experimental group, the total pain mean score decreased notably from 69.33 in the pre-test to 61.74 in the post-test, indicating a clear reduction in perceived pain levels. Similarly, reductions were observed across all pain subscales, particularly in sensory, affective, and evaluative dimensions. The emotion-focused experimental group also demonstrated substantial improvement, with the total pain score decreasing from 68.24 to 60.14. This reduction extended across all subdimensions, especially in affective and evaluative pain perception, suggesting that emotional restructuring contributed to lessening pain intensity. In contrast, both control groups—mindfulness control and emotion-focused control—showed minimal or no change between the pre-test and post-test phases, confirming that the observed improvements were attributable to the therapeutic interventions rather than extraneous factors. Overall, these findings suggest that both mindfulness-based and emotion-focused therapies were successful in reducing pain perception in patients with cardiovascular disease, with slightly greater improvements observed in the emotion-focused therapy group.

Before conducting the main inferential analyses, all necessary statistical assumptions were carefully examined to ensure the validity of the results. Normality of the dependent variables across pre-test and post-test data was tested using the Shapiro–Wilk test, confirming that the distribution of pain perception scores met the normality criterion in all groups. The assumption of homogeneity of variances was verified through Levene's test, indicating equal variance across groups. Additionally, the homogeneity of regression slopes and sphericity were assessed and met, confirming that the relationships between covariates and dependent variables were consistent among the groups and that repeated measures data were appropriate for analysis. No significant outliers or violations of linearity were detected. Taken together, these results confirmed that the data satisfied all statistical assumptions required for conducting the repeated measures ANOVA and post-hoc comparisons, ensuring the reliability and robustness of the inferential findings.

Table 2. Results of Univariate Repeated Measures ANOVA for Pain Perception Variables

Variable	Effect	F Value	df_1	df_2	Significance (p)	Effect Size (η^2)
Total Pain Perception	Time	14.25	1	58	0.000*	0.20
	Group	4.12	1	58	0.047*	0.07
	Time × Group	3.65	1	58	0.061	0.06
Sensory Pain	Time	9.87	1	58	0.003*	0.14
	Group	2.94	1	58	0.092	0.05
	Time × Group	2.33	1	58	0.132	0.04
Affective Pain	Time	8.45	1	58	0.005*	0.13
	Group	3.27	1	58	0.075	0.05
	Time × Group	2.89	1	58	0.094	0.05
Evaluative Pain	Time	11.32	1	58	0.001*	0.16
	Group	3.85	1	58	0.055	0.06
	Time × Group	3.12	1	58	0.083	0.05
Miscellaneous Pain	Time	2.15	1	58	0.148	0.04
	Group	1.78	1	58	0.187	0.03
	Time × Group	1.45	1	58	0.233	0.02

*Significant at $p < 0.05$

The results of the repeated measures univariate ANOVA presented in Table 2 show significant effects of time and group on most pain perception variables, confirming the effectiveness of the interventions. For total pain perception, a significant main effect of time was found ($F = 14.25$, $p < 0.001$, $\eta^2 = 0.20$), indicating that pain perception decreased significantly from pre-test to post-test across participants. The main effect of group was also significant ($F = 4.12$, $p = 0.047$, $\eta^2 = 0.07$), suggesting differences between the treatment groups in their overall reduction of pain perception. However, the time × group interaction effect was not statistically significant ($F = 3.65$, $p = 0.061$), though the trend approached significance, implying that both mindfulness-based and emotion-focused therapies contributed to improvement, with possible variations in the rate of change. Similarly, significant time effects were observed for sensory ($F = 9.87$, $p = 0.003$, $\eta^2 = 0.14$), affective ($F = 8.45$, $p = 0.005$, $\eta^2 = 0.13$), and evaluative ($F = 11.32$, $p = 0.001$, $\eta^2 = 0.16$) dimensions of pain perception, demonstrating meaningful reductions in these components over time. In contrast, no significant effects were found for the miscellaneous pain subscale, indicating that changes in this dimension were minimal. Collectively, these results support that both mindfulness-based and emotion-focused therapies were effective in reducing overall, sensory, affective, and evaluative pain perception among cardiac patients, confirming the interventions' substantial influence on the psychological and perceptual aspects of pain experience.

Table 3. Bonferroni Post-Hoc Test Results

Pairwise Comparison	Group	Mean Difference	Significance (p)
Pre-Test vs. Post-Test (Total Pain)	Mindfulness-Based (Experimental)	7.59	0.001*
	Emotion-Focused (Experimental)	8.10	0.000*
Pre-Test vs. Post-Test (Sensory)	Mindfulness-Based (Experimental)	2.13	0.009*
	Emotion-Focused (Experimental)	1.92	0.011*
Pre-Test vs. Post-Test (Affective)	Mindfulness-Based (Experimental)	1.14	0.032*
	Emotion-Focused (Experimental)	1.99	0.003*
Pre-Test vs. Post-Test (Evaluative)	Mindfulness-Based (Experimental)	2.73	0.005*
	Emotion-Focused (Experimental)	3.02	0.002*
Pre-Test vs. Post-Test (Miscellaneous)	Mindfulness-Based (Experimental)	0.41	0.187
	Emotion-Focused (Experimental)	0.08	0.789

*Significant at $p < 0.05$

The results of the Bonferroni post-hoc test, shown in Table 3, revealed significant reductions in pain perception between pre-test and post-test phases for both experimental groups across most dimensions of pain. In the mindfulness-based experimental group, the total pain score decreased by a mean difference of 7.59 ($p = 0.001$), while in the emotion-focused experimental group, the reduction was slightly greater with a mean difference of 8.10 ($p < 0.001$). Similar significant improvements were found for the sensory, affective, and evaluative dimensions of pain in both intervention groups, with all p-values below 0.05. However, the miscellaneous pain subscale did not show significant change in either group ($p > 0.05$), suggesting that the interventions primarily influenced the cognitive and emotional aspects of pain perception rather than the variable sensory fluctuations. These results confirm that both mindfulness-based and emotion-focused therapies were effective in significantly decreasing overall pain perception and its major subcomponents among cardiac patients.

Table 4. Tukey Post-Hoc Test Results for Total Pain Perception

Pairwise Comparison	Mean Difference	Standard Error	Significance (p)
Mindfulness-Based Experimental vs. Mindfulness-Based Control	7.50	1.10	0.000*
Emotion-Focused Experimental vs. Emotion-Focused Control	8.05	1.10	0.000*
Mindfulness-Based Experimental vs. Emotion-Focused Experimental	-0.55	1.10	0.623

*Significant at $p < 0.05$

The Tukey post-hoc comparisons presented in Table 4 further confirmed the efficacy of both treatment programs compared with their respective control groups. The mindfulness-based experimental group exhibited a significant reduction in total pain perception relative to the mindfulness control group (mean difference = 7.50, $p < 0.001$). Similarly, the emotion-focused experimental group showed an even larger decrease compared with its control counterpart (mean difference = 8.05, $p < 0.001$), highlighting the strong therapeutic effect of emotional processing on pain regulation. However, the difference between the two experimental groups was not statistically significant (mean difference = -0.55, $p = 0.623$), indicating that while both approaches were effective in lowering pain perception, their overall impact was relatively comparable. These findings suggest that mindfulness-based and emotion-focused therapies each offer valuable and equivalent clinical benefits in managing pain perception among patients with cardiovascular disease.

Discussion and Conclusion

The purpose of this study was to compare the effectiveness of mindfulness-based therapy and emotion-focused therapy on pain perception among patients with cardiovascular diseases. The results indicated that both interventions significantly reduced total pain perception and its key subcomponents—sensory, affective, and evaluative pain—compared with control groups. However, no significant difference was found between the two experimental interventions, suggesting that both approaches are equally effective in reducing perceived pain intensity. These findings confirm that psychological interventions targeting emotional regulation and cognitive awareness can play a central role in alleviating pain experiences among cardiac patients, whose symptoms often extend beyond physiological factors and are influenced by psychosocial and affective processes (1, 12).

The reduction in overall pain perception following mindfulness-based therapy can be attributed to the mechanisms of attentional regulation and nonjudgmental awareness that lie at the heart of the mindfulness process. Mindfulness cultivates an individual's ability to observe sensations and emotions as transient events rather than sources of threat, leading to decreased reactivity to pain stimuli and reduced physiological arousal (6). This finding aligns with prior research indicating that mindfulness-based interventions can effectively reduce chronic pain intensity and related psychological distress. For example, Zgierska et al. (6) demonstrated that mindfulness was comparable to cognitive behavioral therapy in reducing chronic low back pain among individuals undergoing opioid treatment, underscoring the neurocognitive flexibility gained through mindful awareness. Similarly, Soukhtanlou et al. (5) reported that a mindfulness-based stress reduction (MBSR) program significantly alleviated chronic pain and improved emotional well-being in elderly patients, emphasizing mindfulness as a mechanism for pain desensitization through attentional reorientation. In line with these findings, the results of the present study support the view that mindfulness interventions enable patients with cardiovascular disease to experience pain without excessive emotional amplification, thereby lowering both subjective pain ratings and physiological stress responses.

Furthermore, the present findings reinforce the notion that mindfulness not only influences pain-related cognition but also modulates psychophysiological reactivity—a particularly relevant factor for cardiac patients. By reducing sympathetic nervous system activation and promoting parasympathetic regulation, mindfulness training can stabilize heart rate variability and decrease systemic stress responses (2). Foulk et al. (2) found that mindfulness-based group therapy for chronic pain in older adults reduced perceived pain and enhanced emotional resilience, which are both critical for cardiovascular regulation. The mechanisms underlying this effect can be understood through interoceptive awareness, in which patients learn to monitor and accept bodily sensations without reactive avoidance. This process reduces emotional distress associated with pain, consistent with previous work by Pouryounes Abkenar et al. (4), who observed improved resilience and quality of life following mindfulness-based cognitive therapy among women suffering from chronic pain. Thus, mindfulness contributes to improved physiological and emotional self-regulation, which explains the observed reductions in pain perception in this study.

Parallel to the effectiveness of mindfulness, emotion-focused therapy (EFT) demonstrated a similar capacity to decrease pain perception across the sensory, affective, and evaluative domains. The results revealed significant improvements from pre-test to post-test, confirming that emotion processing and transformation techniques are effective in altering the affective experience of pain among cardiac patients.

EFT operates by guiding individuals to access and reprocess core emotions—such as fear, anger, or helplessness—that often underlie chronic pain experiences (10). When patients confront and transform these emotions rather than suppress them, their physiological and emotional responses become more adaptive. This finding corresponds with Doshmanfana et al. (12), who found that EFT significantly enhanced emotion regulation and resilience in patients with chronic pain and depressive symptoms. Similarly, Ertezaee et al. (10) showed that EFT reduced mental pain and experiential avoidance in women with depression, suggesting that confronting emotional experiences can mitigate the intensity of both psychological and somatic pain.

From a biopsychosocial perspective, these findings suggest that both interventions work through distinct yet complementary mechanisms. Mindfulness primarily modulates attention and cognitive appraisal, while emotion-focused therapy facilitates emotional restructuring and relational awareness. Shokrolahi et al. (11) reported that EFT significantly reduced anxiety sensitivity and pain catastrophizing in patients with chronic pain and alexithymia, outcomes that mirror the reduction in affective and evaluative pain subscales in this study. Moreover, Shokrolahi et al. (18) previously compared EFT with cognitive analytic therapy and found both effective in reducing anxiety and experiential avoidance, though EFT was more effective in addressing maladaptive emotional processing. The current findings echo this pattern, demonstrating that emotion transformation—not suppression—reduces distress-related amplification of pain signals. For cardiac patients, whose pain perception is closely tied to stress-induced physiological reactivity, this emotional modulation may translate into measurable improvements in cardiovascular function.

The nonsignificant difference between the two interventions in this study is also noteworthy. Both mindfulness-based and emotion-focused therapies are rooted in experiential approaches that emphasize awareness, acceptance, and the transformation of internal experiences (9). Kruse and Seng (9) found that mindfulness-based cognitive therapy induced significant positive changes in cognitive appraisal among migraine patients, similar to how EFT encourages patients to reinterpret their emotional experience of pain. In both methods, the shift from avoidance to awareness plays a crucial role in decreasing physiological arousal and cognitive distress. Therefore, the comparable outcomes in the present study may reflect shared underlying mechanisms of emotional awareness, acceptance, and regulation.

The improvement across sensory, affective, and evaluative subscales highlights the multidimensional efficacy of both interventions. Pain perception is not only a neurological event but also a psychological construct influenced by emotion, cognition, and attention. The affective and evaluative dimensions of pain, which are closely related to emotional interpretation and meaning-making, showed significant decreases after therapy, aligning with findings by Arefian et al. (3), who demonstrated that mindfulness-integrated CBT reduced both physical pain and existential distress in cancer patients. Similarly, Seyed Ali Tabar and Zadhasn (14) observed that mindfulness-based cognitive therapy reduced mental pain and improved psychological hardiness in breast cancer patients, suggesting that mindfulness changes not only sensory awareness but also the emotional appraisal of pain.

Furthermore, cultural and contextual elements may have enhanced the efficacy of these therapies among Iranian patients with cardiovascular disease. The integration of emotional expression and physiological monitoring (heart rate feedback) resonates with patients' tendency to conceptualize pain as both a bodily and emotional phenomenon. Changi Ashtiani et al. (1) found that mindfulness-based schema therapy effectively reduced mental pain and experiential avoidance in cardiac patients, indicating that acceptance-

based interventions align well with the cognitive–emotional structure of cardiovascular distress. This supports the interpretation that both mindfulness-based and emotion-focused therapies effectively modulate the interaction between psychological processes and physiological outcomes.

On the emotional dimension, emotion-focused therapy likely achieved reductions in pain perception through the reorganization of maladaptive emotional responses. According to Ertezaee et al. (10), emotional reprocessing facilitates a shift from defensive emotions such as anger or fear to adaptive emotions like acceptance and compassion. This transformation directly decreases physiological arousal and alters the affective representation of pain. Similarly, Sheikh Mohammadi et al. (16) found that compassion-focused group counseling significantly reduced emotional pain in women with breast cancer, suggesting that emotional restructuring enhances self-compassion and reduces perceived suffering. These findings corroborate the current study's results by emphasizing that addressing emotional pain is critical to reducing physical pain perception.

The present study also adds to the growing body of literature linking emotion regulation to psychophysiological outcomes. Emotional dysregulation and chronic stress are known to exacerbate cardiovascular dysfunction through hormonal and inflammatory pathways (8). By promoting awareness and emotional transformation, both mindfulness and EFT may contribute to autonomic balance and reduced systemic stress. Bagheri Sheykhangafshe et al. (8) showed that mindfulness-based cognitive therapy improved emotional regulation and reduced pain intensity in children with irritable bowel syndrome, further confirming the interconnection between emotional regulation and physiological functioning. Similarly, Barghi Irani and Dehghan Saber (13) observed that mindfulness training reduced irrational beliefs and anxiety among older women, which parallels the current findings that emotional acceptance lowers distress associated with pain.

Overall, these findings indicate that both mindfulness-based and emotion-focused therapies can serve as valuable adjuncts to medical treatment in cardiac rehabilitation. The observed reduction in pain perception across multiple dimensions demonstrates that psychotherapeutic interventions addressing cognitive–emotional mechanisms are essential for holistic cardiovascular care. The evidence from this study aligns with prior research emphasizing the bidirectional relationship between emotional well-being and physical health (15). Ebrahimi Sadr et al. (15) showed that mindfulness-based cognitive therapy improved pain anxiety and quality of life in headache patients, a finding consistent with the current study's conclusion that awareness-based interventions reduce pain-related distress. Therefore, both mindfulness-based and emotion-focused therapies can be viewed as complementary models that strengthen emotional resilience, reduce physiological strain, and enhance overall recovery in cardiac populations.

Despite its contributions, this study has several limitations. The sample size was relatively small and limited to patients in one geographic region, which may restrict the generalizability of the findings to broader cardiovascular populations. The reliance on self-report questionnaires for assessing pain perception introduces the potential for subjective bias, as participants' emotional state or social desirability could have influenced their responses. Additionally, while heart rate monitoring was incorporated as an objective index, other physiological measures such as cortisol levels or heart rate variability were not included, which could have provided a more comprehensive understanding of psychophysiological changes. The duration of follow-up was also limited, preventing assessment of the long-term sustainability of therapeutic effects. Moreover,

the study did not include a combined intervention group, which might have revealed potential synergistic effects of integrating mindfulness and emotion-focused components.

Future studies should employ larger, more diverse samples to increase the external validity of findings and examine gender or age differences in therapeutic response. Incorporating longitudinal follow-ups would clarify whether the observed improvements in pain perception are maintained over time. Future research may also benefit from including physiological indicators such as heart rate variability, inflammatory markers, and stress hormones to better elucidate the biological pathways underlying therapeutic change. Comparative studies could also explore hybrid intervention models combining mindfulness and emotion-focused techniques to examine potential additive or synergistic effects on cardiovascular health and pain perception. Furthermore, qualitative investigations could enrich understanding of patients' lived experiences during these therapies, revealing the nuanced processes of emotional and cognitive transformation.

Clinicians and health psychologists working with cardiac patients are encouraged to integrate mindfulness-based and emotion-focused interventions as part of comprehensive rehabilitation programs. Structured group formats can facilitate peer support and improve adherence, while incorporating physiological feedback (such as heart rate monitoring) can enhance patient awareness of mind–body connections. Therapists should tailor interventions to individual emotional and cognitive profiles, ensuring that patients develop sustainable self-regulation skills beyond the clinical setting. Finally, collaboration between cardiologists and mental health professionals is essential to promote holistic treatment approaches that address both psychological and physiological aspects of recovery, ultimately enhancing quality of life and long-term cardiovascular outcomes.

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Authors' Contributions

All authors equally contributed to this study.

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.

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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