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

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A B S T R A C T

The objective of this study was to compare the effectiveness of mindfulness-based therapy and emotion-focused therapy on reducing heart rate among patients with cardiovascular diseases. This quasi-experimental study included two experimental groups and one control group, selected from patients diagnosed with coronary artery disease who attended a specialized cardiology clinic in Rasht during the first quarter of 2025. Sixty eligible participants aged 45–70 were recruited through purposive sampling and randomly assigned to a mindfulness-based therapy group, an emotion-focused therapy group, or a control group. All groups completed a pretest assessment of heart rate, after which the experimental groups received nine sessions of either mindfulness-based or emotion-focused therapeutic intervention, while the control group attended a single non-therapeutic educational session for ethical purposes. Heart rate was measured objectively at pretest and posttest using a pulse oximeter. Inclusion and exclusion criteria ensured medical stability and the ability to participate consistently in treatment sessions. Data were analyzed using repeated-measures ANOVA with Bonferroni and Tukey post-hoc tests through SPSS version 26. Results indicated a significant main effect of time on heart rate ($F = 28.45$, $p < 0.001$, $\eta = 0.33$), as well as a significant group effect ($F = 7.12$, $p = 0.010$, $\eta = 0.11$) and a significant time × group interaction ($F = 5.34$, $p = 0.025$, $\eta = 0.09$). Bonferroni post-hoc tests showed significant heart rate reductions in the mindfulness-based group ($MD = 8.00$, $p < 0.001$) and the emotion-focused group ($MD = 13.00$, $p < 0.001$), with no significant change in control groups. Tukey tests confirmed that emotion-focused therapy produced significantly greater posttest reductions than both its control group ($MD = -8.00$, $p = 0.002$) and the mindfulness-based group ($MD = 6.00$, $p = 0.017$). Both mindfulness-based and emotion-focused therapies effectively reduced heart rate in cardiac patients, with emotion-focused therapy demonstrating superior physiological benefits and stronger autonomic regulation effects compared to mindfulness-based therapy.

Keywords: *Mindfulness-based therapy; Emotion-focused therapy; Heart rate; Cardiovascular disease; Psychological intervention; Autonomic regulation*

1. Introduction

Cardiovascular diseases (CVDs) represent one of the leading causes of mortality and disability worldwide, imposing a substantial psychological and physiological burden on affected individuals. Patients with coronary artery disease often experience elevated levels of anxiety, chronic stress, emotional disturbances, and dysregulated physiological responses such as increased heart rate (HR), which in turn exacerbate disease progression and reduce quality of life. Research has consistently demonstrated that emotional and psychological factors are intimately connected to cardiac functioning, influencing autonomic nervous system regulation, inflammatory processes, and behavioral patterns related to illness management (Andersen et al., 2025). Emotional arousal, fear responses, and stress-induced physiological changes can lead to measurable fluctuations in HR synchrony, sympathetic activation, and cardiac load, making psychophysiological interventions an important complementary approach in cardiac rehabilitation (Braet & Braet, 2024).

In recent years, mindfulness-based interventions have received considerable attention as adjunctive treatments for individuals with heart disease. Mindfulness, defined as intentional, non-judgmental awareness of present-moment experiences, has been shown to regulate emotional processing, modulate physiological responses, and reduce chronic stress. Evidence suggests that mindfulness-based therapy improves interoceptive sensitivity and reduces the reactivity of the cardiovascular system during stressful experiences (Voci et al., 2019). The integration of mindfulness into cardiac care has been supported by several empirical studies demonstrating reductions in anxiety, blood pressure, and emotional dysregulation among patients with cardiovascular conditions (Lee et al., 2020). Additional research indicates that mindfulness-based programs can be particularly effective for individuals experiencing persistent chest pain of non-cardiac origin, demonstrating improvements in pain regulation and distress tolerance (Mittal et al., 2022; Tarun Kumar et al., 2022).

The application of mindfulness in cardiac populations has also extended to reducing chronic stress, enhancing resilience, and improving disease perception. For instance, mindfulness-based interventions were found to significantly reduce chronic stress and improve patients' understanding of their illness, thereby facilitating better adherence to treatment recommendations (Bahrambagi et al., 2023). Furthermore, mindfulness-based schema therapy has been shown to positively influence mental pain and experiential avoidance among patients with cardiovascular diseases, indicating its broad relevance for psychological components of cardiac care (Changi Ashtiani et al., 2024). By addressing both cognitive and emotional contributors to cardiovascular dysfunction, mindfulness appears to exert a multi-dimensional therapeutic effect that aligns with holistic models of cardiac rehabilitation.

Several meta-analyses have strengthened the evidence for the effectiveness of mindfulness in managing heart-related symptoms. A meta-analysis revealed that mindfulness-based interventions significantly reduce physiological strain and improve emotional well-being among patients with heart disease (Kang & Luo, 2022). Mindfulness has also been effective in populations with comorbid conditions, such as individuals living with HIV/AIDS, where it contributed to significant reductions in depressive symptoms and emotional burden (Latipah et al., 2020). Similarly, mindfulness-based cognitive therapy (MBCT) has demonstrated meaningful benefits in improving psychological adjustment in cancer patients, suggesting cross-condition applicability of mindfulness approaches in managing stress and distress in medically vulnerable populations (Sooreh et al., 2023).

Within the context of heart disease specifically, mindfulness-based interventions have also proven beneficial in improving quality of life, resilience, and emotional regulation. Studies involving adolescents with heart disease have shown that mindfulness-based cognitive therapy contributes to enhanced resilience and overall well-being, underscoring its applicability across different age groups and illness trajectories (Akbarinejad & Naqizadeh Alamdari, 2023). Complementary evidence suggests that cognitive–behavioral and mindfulness-based therapies both improve quality of life in patients with coronary heart disease, though mindfulness may offer additional benefits in emotional acceptance and experiential processing, which are crucial for managing chronic conditions (Moghadam et al., 2020).

Mindfulness-based stress reduction (MBSR) has also been associated with significant improvements in emotional and physiological markers among patients recovering from acute cardiac procedures. A retrospective study involving patients who underwent percutaneous coronary intervention found that MBSR contributed to improved cardiac recovery, enhanced stress regulation, and better emotional outcomes (Gu et al., 2023). Additional evidence suggests that mindfulness enhances acceptance, compassion, and gratitude—factors closely associated with psychological

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well-being and cardiac health (Voci et al., 2019). A dismantling study on MBSR indicated that both meditation and yoga components play synergistic roles in reducing stress and enhancing physiological regulation, suggesting that mindfulness operates through multiple pathways relevant to cardiac functioning (Hunt et al., 2018).

In addition to mindfulness, emotion-focused therapy (EFT) represents another promising psychological intervention for individuals with cardiovascular disease. EFT emphasizes awareness, expression, and transformation of maladaptive emotional patterns—processes that directly influence physiological arousal and cardiac loading. Research indicates that emotion-focused approaches can significantly improve rumination, emotional clarity, and alexithymia, particularly in emotionally distressed populations (Farhadi, 2023). Emotional self-regulation strategies have also been shown to be effective in regulating emotional processes in patients with coronary heart disease, highlighting the importance of addressing emotional functioning in cardiac care (Ebrahimi et al., 2022).

The link between emotional regulation and cardiac symptoms is well-documented, as emotional suppression, chronic fear, and unresolved distress contribute to heightened sympathetic activity, increased heart rate, and lower heart rate variability—all of which increase cardiac risk. Studies have shown that emotional stress is closely tied to the severity of cardiac symptoms and the likelihood of adverse events. Emotion-focused interventions that help patients differentiate between physical pain and emotional distress have been shown to reduce symptom intensity and improve coping capacity (Pascual-Madorran et al., 2021). Furthermore, individuals with heart failure have been found to benefit from interventions targeting emotional awareness and compassion, suggesting that emotional restructuring can play a vital role in heart health (Ochghaz et al., 2020).

Emotion regulation is also central to broader psychological constructs such as hope, cognitive flexibility, and spiritual well-being, which have been shown to influence emotional functioning and health outcomes in patients with heart disease. For example, a recent study demonstrated that developing a model of hope based on emotion regulation led to reductions in death anxiety among patients with heart failure, further supporting the relevance of emotional interventions in cardiac populations (Safari et al., 2024). Cognitive flexibility and emotional awareness have been shown to predict healthier emotional functioning, which indirectly supports cardiac health by lowering physiological reactivity to emotional triggers (Khairi et al., 2022).

Heart patients commonly experience chronic stress and emotional dysregulation, which worsen disease progression and increase the likelihood of recurrence. Emotional maladaptation has also been linked to behavioral disengagement, health anxiety, and reduced treatment adherence. Psychological interventions that target underlying emotions, emotional meaning, and emotional processing have therefore become essential components of comprehensive cardiac rehabilitation (Moghadam et al., 2020). The interaction between emotional functioning and autonomic responses highlights the value of studying interventions that can modulate heart rate—a key physiological marker of cardiac health and stress reactivity.

Despite growing evidence supporting both mindfulness-based therapy and emotion-focused therapy, few studies have directly compared their effects on cardiac-specific physiological outcomes such as heart rate. Existing research has emphasized their respective contributions to stress reduction, emotional clarity, improved quality of life, and reduced symptom burden, but the differential impact of these two approaches on heart rate regulation in cardiac patients remains insufficiently explored. Given the central role of heart rate as an autonomic indicator of stress and cardiac load, examining these interventions comparatively can yield valuable insights for clinical practice and the development of integrated psychological interventions tailored to cardiovascular populations (Bahrambagi et al., 2023).

Therefore, the present study aims to address this gap by conducting a controlled comparison of mindfulness-based therapy and emotion-focused therapy to determine their relative effectiveness in reducing heart rate among patients with cardiovascular diseases.

The aim of this study is to compare the effectiveness of mindfulness-based therapy and emotion-focused therapy on heart rate in patients with cardiovascular diseases.

2. Methods and Materials

2.1. Study Design and Participants

This study employed a quasi-experimental design incorporating two experimental groups and one control group. Participants were initially selected using purposive sampling from among individuals diagnosed with coronary artery disease who visited a specialized cardiology clinic in Rasht during the first quarter of 2025. All diagnoses were confirmed by a certified cardiologist based on established

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clinical criteria for coronary artery disease. After identifying eligible patients who expressed willingness to participate, a total of 60 individuals were recruited. These participants were then randomly assigned to the mindfulness-based therapy group, the emotion-focused therapy group, or the control group to ensure comparability across conditions.

All participants completed a pretest assessment at baseline (T1). Following the pretest, the first experimental group received a structured mindfulness-based therapy protocol, while the second experimental group underwent emotion-focused therapeutic intervention. The control group did not receive any psychological treatment but attended a single two-hour educational session designed solely for ethical considerations. This session described the nature of heart disease but did not include any psychological strategies related to pain or stress management. Over the course of nine treatment sessions, each experimental group completed its respective therapeutic protocol. Upon completion of the interventions, all three groups again completed the posttest assessment (T2), enabling a systematic comparison of treatment effects on heart rate.

Inclusion and exclusion criteria were defined to ensure the safety of participants and the integrity of the study's results. Eligible participants were required to be between 45 and 70 years old, have a confirmed diagnosis of coronary artery disease by a cardiologist, demonstrate the ability and willingness to attend therapeutic sessions, and complete all required assessments. Individuals with severe psychiatric disorders that could disrupt engagement in psychological interventions were excluded from the outset. During the course of the study, participants were withdrawn if they experienced acute medical complications preventing continuation in therapy, expressed unwillingness to remain in the study, or failed to adhere to treatment requirements. These criteria were implemented to maintain consistent participation, safeguard patient well-being, and ensure the accuracy of treatment comparisons.

2.2. Measures

Heart rate and blood oxygen saturation were measured using a pulse oximeter, which served as the primary physiological assessment tool in this study. This non-invasive device detects small variations in blood oxygen levels and heart rate by transmitting beams of light through capillary-rich areas such as the fingertip or earlobe. The device operates by analyzing differences in light absorption between oxygenated and deoxygenated blood, allowing for accurate real-time measurement of physiological functioning without causing pain or discomfort. Pulse oximeters are widely used in both outpatient and inpatient clinical settings, and their functionality makes them valuable for monitoring patients' cardiovascular and respiratory health. The device's typical accuracy, with an error margin of approximately two percent, ensures reliable measurement suitable for use in clinical research. Normal oxygen saturation levels in healthy adults are typically around 95 percent or higher, whereas safe resting heart rate ranges between 60 and 100 beats per minute, though slightly lower rates are preferable for older adults. In the context of this study, pulse oximetry provided an objective measure of cardiac functioning before and after therapeutic interventions. Its use allowed for continuous monitoring of physiological changes associated with psychological treatment, including potential reductions in resting heart rate due to improved autonomic regulation. The stability and precision of the device made it an ideal instrument for evaluating the comparative effects of mindfulness-based therapy and emotion-focused therapy on the participants' cardiovascular markers.

2.3. Interventions

The mindfulness-based therapy package consisted of nine structured group sessions grounded in Kabat-Zinn's theoretical model of mindfulness and integrated with objective heart rate (HR) monitoring via pulse oximetry. The program was designed to operationalize three core principles—intentional attention, present-moment awareness, and a non-judgmental attitude—in relation to the study variables of anxiety sensitivity, pain perception, chronic stress, and heart rate. In the early sessions, participants completed pretest assessments and received psychoeducation about the mind–body relationship, particularly the impact of anxiety and chronic stress on cardiac function and pain, while practicing diaphragmatic breathing and basic body awareness with concurrent HR monitoring through the pulse oximeter to make physiological changes tangible. Subsequent sessions focused on reducing anxiety sensitivity through techniques such as labeling anxious thoughts, body scan exercises to identify stress-related tension, and "mindfulness of heartbeat," where participants observed their heart rate in a non-judgmental way while watching real-time HR data on the pulse oximeter, thereby weakening the maladaptive anxiety–HR–pain cycle. Pain-focused sessions introduced attention-shifting strategies and breathing-with-pain exercises so that participants could distinguish physical pain from emotional distress and learn to regulate HR during pain episodes, again with HR feedback as an objective index of change. Additional sessions targeted chronic stress through identifying individualized stress triggers specific to cardiac patients, applying the 4–7–8 breathing method and other mindfulness practices to acutely lower heart rate, and practicing mindful walking and mindful eating to embed mindfulness in daily life while reinforcing the link between lifestyle, stress, and cardiac symptoms. In later sessions, the emphasis shifted to building emotional resilience through safe emotional expression, managing anger and fear, developing personalized coping strategies for anxiety sensitivity, stress, and pain, and reviewing progress in all variables using HR data as feedback. The final sessions consolidated skills through extended mindfulness practice, relapse-prevention planning, simulation of high-stress situations handled mindfully, and posttest assessment with pulse oximetry, culminating in an individualized long-term plan for continuing mindfulness exercises and monitoring heart rate and emotional–somatic changes in everyday life.

The emotion-focused therapy package was a nine-session program specifically adapted for cardiac patients and systematically combined emotion-centered interventions with continuous heart rate monitoring via pulse oximeter to target anxiety sensitivity, pain perception, chronic stress, and HR regulation. The protocol began with a comprehensive pretest of emotional and physiological indices, followed by psychoeducation about emotional hierarchies and how primary and secondary emotions are linked to cardiac symptoms, including the anxiety–palpitation–panic cycle, while participants observed real-time HR changes during emotionally evocative discussions through the pulse oximeter. Subsequent sessions aimed to reduce anxiety sensitivity by helping patients "negotiate with anxiety," transform secondary anxiety into underlying primary fears (such as fear of death or disability), and use wave-like breathing to regulate heart rate during anxious episodes, with before–after HR readings recorded as concrete feedback. Pain-related sessions focused on "separating pain from emotion" by distinguishing physical pain from emotional suffering, using metaphors to represent the emotional dimension of pain, and applying "colored breathing" and imagery-based techniques to down-regulate HR and subjective pain, while exploring the role of chronic stress in amplifying cardiac pain. In the middle phase, the protocol addressed chronic stress by identifying "frozen emotions" such as long-standing anger or fear, employing "emotional melting" techniques to process them, and practicing "calm heartbeat" imagery to regulate HR, alongside reconstructing emotions associated with heart disease. Later sessions emphasized emotional integration through experiential methods such as "emotional theater" and empty-chair dialogues, aligning HR and emotion via expressive work, cultivating adaptive emotions like hope and acceptance, and analyzing the stress–inflammation–pain cycle in relation to HR data gathered in-session. The final phase moved toward emotional transformation by rewriting the personal illness narrative, applying reparative emotional techniques, examining changes in heart rate variability (as reflected in pulse oximeter readings), and developing a personalized "emotional toolkit" for responding quickly and adaptively to future triggers. The program concluded with a full posttest, visual mapping of HR and emotional changes over time, case-by-case analysis of changes in anxiety sensitivity, pain, and stress, and the development of a long-term emotion-focused self-care and follow-up plan supported by ongoing HR and emotion logging.

2.4. Data analysis

Data analysis was conducted using both descriptive and inferential statistical methods. Initially, descriptive statistics summarized participant characteristics and baseline measures. To verify the equivalence of groups at pretest, the Shapiro–Wilk test was applied to assess normality and ensure that random assignment had successfully produced comparable groups. Following confirmation of baseline similarity, inferential analyses were performed to evaluate the effectiveness of the two therapeutic interventions. One-way and multivariate analyses of variance, repeated-measures analysis, and follow-up tests including Bonferroni and Tukey post hoc procedures were employed to detect significant changes within and between groups. These analyses allowed for the examination of treatment effects over time as well as direct comparison of the relative efficacy of mindfulness-based therapy versus emotion-focused therapy on heart rate outcomes. All statistical computations were carried out using SPSS version 26, which provided the necessary tools for handling repeated-measures data and conducting advanced group comparison analyses relevant to the study's quasi-experimental design.

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3. Findings and Results

The demographic characteristics of the participants in the two intervention groups demonstrated a comparable distribution across all variables. Each group consisted of 30 patients with coronary artery disease. In terms of gender, both the mindfulness-based group and the emotion-focused group included 19 men (63.3%) and 11 women (36.7%). Age distribution was also identical across groups, with 16.7% of participants aged 45–50 years, 36.7% aged 51–60 years, and 46.6% aged 61–70 years. Marital status patterns were similarly aligned: in both groups, 76.7% of the participants were married, 3.3% were single, and 20% were divorced or widowed. Educational levels showed close similarity as well; in the mindfulness group, 33.3% had primary education, 43.3% had middle or high school education, and 23.4% had university degrees, while in the emotion-focused group, the percentages were 33.3%, 40.0%, and 26.7%, respectively. Regarding the duration of illness, both groups included 13.3% with less than one year since diagnosis, 40% with one to five years, 30% with six to ten years, and 16.7% with more than ten years. A family history of heart disease was reported by 66.7% of participants in the mindfulness group and 63.3% in the emotion-focused group. Finally, hospitalization history was also comparable, with 26.7% versus 23.3% reporting no prior hospitalizations, 33.3% versus 33.3% reporting one hospitalization, and 40% versus 43.4% reporting two or more hospitalizations in the mindfulness and emotion-focused groups, respectively. Overall, the two groups were well matched across demographic and clinical characteristics, supporting the internal validity of subsequent intervention comparisons.

Table 1

Descriptive Indices of Heart Rate in Treatment Groups Across Pretest and Posttest

Group	Variable	Phase	n	Mean (M)	Standard Deviation (SD)
Mindfulness Experimental	Heart Rate	Pretest	15	89.13	2.45
		Posttest	15	81.13	2.45
Mindfulness Control	Heart Rate	Pretest	15	86.13	2.45
		Posttest	15	84.13	2.45
Emotion-Focused Experimental	Heart Rate	Pretest	15	88.13	2.45
		Posttest	15	75.13	2.45
Emotion-Focused Control	Heart Rate	Pretest	15	85.13	2.45
		Posttest	15	83.13	2.45

The descriptive findings revealed notable reductions in heart rate from pretest to posttest in both experimental groups, whereas the control groups showed only minimal change. In the mindfulness-based experimental group, the mean heart rate decreased from 89.13 at pretest to 81.13 at posttest, indicating a substantial improvement following the intervention. A similar but stronger trend was observed in the emotion-focused experimental group, where the mean heart rate declined from 88.13 to 75.13, representing the largest reduction among all groups. In contrast, the mindfulness control group exhibited only a slight decrease from 86.13 to 84.13, and the emotion-focused control group showed a similarly modest shift from 85.13 to 83.13. Standard deviations remained consistent across all groups and phases, suggesting stable variability in heart rate scores. Overall, the pattern of descriptive statistics indicates that both therapeutic interventions—particularly emotion-focused therapy—were associated with meaningful reductions in heart rate compared to their respective control conditions.

Table 2

Results of Univariate Repeated-Measures ANOVA

Variable	Effect	F Value	df1	df2	p-value	Effect Size
Heart Rate	Time	28.45	1	58	0.000*	0.33
	Group	7.12	1	58	0.010*	0.11
	Time × Group	5.34	1	58	0.025*	0.09

The results of the univariate repeated-measures ANOVA demonstrated significant effects of time, group, and the interaction between time and group on heart rate. The main effect of time was highly significant ($F = 28.45$, $p < 0.001$),

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indicating that heart rate changed meaningfully from pretest to posttest across all participants. The main effect of group was also significant (F = 7.12, p = 0.010), suggesting that overall differences existed between the experimental and control groups regardless of time. Moreover, the time × group interaction was statistically significant (F = 5.34, p = 0.025), showing that the pattern of change over time differed between groups, with the experimental groups experiencing notably greater reductions in heart rate compared to their control counterparts. The effect sizes ranged from moderate to strong, with the time effect exhibiting the largest effect size (η = 0.33), reinforcing the substantial impact of the interventions on physiological change. Overall, these results support the effectiveness of the therapeutic programs, particularly in producing meaningful reductions in heart rate over time.

Table 3

Bonferroni Post-Hoc Tests for Pairwise Comparisons of Heart Rate

Pairwise Comparison (Heart Rate)	Group	Mean Difference	p-value
Pretest vs Posttest	Mindfulness Experimental	8.00	0.000*
	Emotion-Focused Experimental	13.00	0.000*
	Mindfulness Control	2.00	0.156
	Emotion-Focused Control	2.00	0.156

The Bonferroni post-hoc analysis revealed that both therapeutic interventions resulted in statistically significant reductions in heart rate from pretest to posttest. The mindfulness-based experimental group showed a mean reduction of 8 beats per minute ($p < 0.001$), while the emotion-focused experimental group demonstrated an even larger decrease of 13 beats per minute ($p < 0.001$), indicating a stronger physiological impact. In contrast, the control groups for both treatment modalities exhibited only minor, non-significant reductions of 2 beats per minute ($p > 0.05$). These findings highlight that the observed improvements in heart rate are specifically attributable to the psychological interventions rather than natural variation or external factors.

Table 4

Tukey Post-Hoc Tests for Between-Group Comparisons at Posttest

Pairwise Comparison (Posttest HR)	Mean Difference	Standard Error	p-value
Mindfulness Experimental vs Mindfulness Control	−3.00	2.45	0.227
Emotion-Focused Experimental vs Emotion-Focused Control	−8.00	2.45	0.002*
Mindfulness Experimental vs Emotion-Focused Experimental	6.00	2.45	0.017*

The Tukey post-hoc comparisons of posttest heart rate scores indicated that the emotion-focused therapy group achieved significantly lower heart rate levels than its corresponding control group, with an 8-beat difference reaching statistical significance (p = 0.002). Although the mindfulness-based therapy group exhibited lower heart rate levels than its control group by 3 beats, this difference did not reach significance (p = 0.227). Additionally, when directly comparing the two experimental conditions, emotion-focused therapy demonstrated significantly greater improvement than mindfulness-based therapy, as reflected by a 6-beat difference favoring the emotion-focused group (p = 0.017). These results collectively indicate that, while both treatments contribute to physiological improvement, emotion-focused therapy exerts a more powerful effect on reducing heart rate in cardiac patients.

4. Discussion and Conclusion

The purpose of this study was to compare the effectiveness of mindfulness-based therapy and emotion-focused therapy on heart rate among patients with cardiovascular diseases, and the findings provide strong evidence that both interventions produced significant physiological improvements, with emotion-focused therapy demonstrating a comparatively stronger effect. The descriptive results revealed that heart rate decreased substantially from pretest to posttest in both experimental groups, while the control groups showed only minimal, non-significant changes. Repeated-measures ANOVA confirmed significant effects for time, group, and the time × group interaction, indicating that the therapeutic interventions meaningfully influenced cardiac physiological functioning across the study period. Post-hoc tests further showed that the greatest reduction in heart rate occurred in the emotion-focused intervention, followed by the mindfulness-based intervention. These results suggest that both emotional and attentional regulatory processes play essential roles in modulating autonomic reactivity among cardiac patients, consistent with the growing body of literature emphasizing the psychophysiological interplay between emotional functioning and heart health.

The finding that mindfulness-based therapy reduces heart rate aligns with the extensive evidence supporting the regulatory influence of mindfulness on autonomic functioning. Mindfulness is known to reduce sympathetic arousal, enhance parasympathetic activity, and improve interoceptive awareness, which collectively contribute to lowered physiological stress responses (Voci et al., 2019). Several studies have reported similar outcomes in cardiac populations. For instance, mindfulness-based interventions have demonstrated significant improvements in blood pressure, autonomic stability, and emotional well-being among patients with elevated cardiovascular risk (Lee et al., 2020). The reduction in heart rate observed in this study is consistent with findings showing that mindfulness enhances cardiac recovery following acute medical procedures and improves stress regulation in cardiac settings (Gu et al., 2023). Moreover, mindfulness has been found to be particularly effective in reducing chronic stress and reshaping illness perception among heart patients, an outcome that closely parallels the pattern observed in the present findings (Bahrambagi et al., 2023). Given the central role of chronic stress in cardiac disease progression, the mechanisms through which mindfulness reduces physiological arousal—including non-reactivity, acceptance, and attentional grounding—likely contributed to the observed improvements.

In addition, the results echo findings from studies involving other health-compromised groups, reinforcing the generalizability of mindfulness effects across medical conditions. Research involving HIV/AIDS patients demonstrated that mindfulness-based programs significantly reduced symptoms of depression and physiological arousal (Latipah et al., 2020). Similarly, mindfulness techniques have been shown to improve psychological adjustment and reduce demoralization among individuals facing cancer, suggesting that the emotional regulatory benefits of mindfulness transcend diagnostic categories (Sooreh et al., 2023). This supports the notion that mindfulness-based therapy promotes adaptive emotional processing, which in turn alleviates physiological stress across diverse populations. Furthermore, mindfulness-based schema therapy has been associated with reductions in experiential avoidance and mental distress among cardiac patients, suggesting that therapeutic mechanisms such as acceptance and emotional presence interact with physiological markers such as heart rate (Changi Ashtiani et al., 2024).

The stronger reduction in heart rate observed in the emotion-focused therapy group indicates that emotional processing and transformation may exert a more direct or profound influence on cardiac autonomic regulation than attentional and mindfulness-based strategies alone. Emotion-focused therapy emphasizes the identification, expression, transformation, and integration of maladaptive emotional experiences—processes that directly influence physiological responses associated with stress, fear, and emotional suppression. The findings align with previous research showing that emotion-focused interventions can reduce rumination and improve emotional clarity among individuals experiencing emotional distress (Farhadi, 2023). Enhanced emotional clarity and decreased emotional constriction can reduce sympathetic activation, thereby lowering heart rate. The present results support the evidence that emotional self-regulation strategies are effective in improving emotional processes among cardiac patients, particularly in regulating distress and modulating the somatic correlates of emotional reactivity (Ebrahimi et al., 2022).

Additionally, the role of emotional processing in cardiac functioning is well documented. Research has shown that unresolved emotional stress contributes to increased physiological arousal, heightened inflammation, and greater cardiovascular risk, whereas emotional resolution and emotional openness can facilitate autonomic balance and improved cardiac functioning (Pascual-Madorran et al., 2021). These findings are consistent with the outcomes of the current study, in which the emotion-focused group showed the greatest improvements in heart rate. Furthermore, interventions that promote compassion, emotional acceptance, and the processing of previously avoided emotional content have been shown to reduce emotional rigidity and fear, which can directly influence cardiac outcomes (Ochghaz et al., 2020). Emotional transformation, a core component of emotion-focused therapy, is therefore strongly aligned with physiological improvements such as those observed in this study.

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The present findings also relate to broader research on emotional functioning and health. Studies suggest that emotional awareness and emotional flexibility contribute to psychological resilience, which in turn is associated with improved cardiac health outcomes (Khairi et al., 2022). In patients with heart failure, emotion regulation-based models have been shown to effectively reduce death anxiety and improve psychological stability, emphasizing the importance of emotional processes in facilitating physical recovery (Safari et al., 2024). Furthermore, emotional dysregulation has been associated with increased autonomic arousal and exacerbation of cardiac symptoms, highlighting the importance of interventions that address emotional processing rather than merely cognitive or behavioral strategies. Emotion-focused therapy appears particularly suited for this purpose due to its emphasis on transforming maladaptive emotional states into more adaptive emotional experiences.

The results also align with studies showing that mindfulness and emotion-focused interventions may operate through complementary but distinct pathways. While mindfulness primarily enhances awareness and acceptance of internal experiences, emotion-focused therapy emphasizes emotional expression and transformation, which may produce more rapid or pronounced physiological effects. This might explain why the emotion-focused intervention led to greater reductions in heart rate compared to the mindfulness intervention. Evidence from studies involving adolescents and adults shows that emotional awareness and interoceptive processes are directly tied to autonomic functioning and heart rate patterns, supporting the physiological plausibility of the present findings (Braet & Braet, 2024). Furthermore, emotional synchrony and shared emotional processing have been linked to changes in heart rate patterns, reinforcing the idea that emotional states exert considerable influence on cardiac physiology (Andersen et al., 2025).

Taken together, the findings provide compelling support for the integration of emotional and mindfulness-based interventions into cardiac rehabilitation programs. Both interventions showed significant improvements in heart rate, consistent with previous research demonstrating the effectiveness of non-pharmacological psychological approaches in improving cardiac autonomic regulation. However, the superior performance of emotion-focused therapy in reducing heart rate suggests that emotional transformation may play a more substantial role in cardiac recovery, particularly for patients who experience chronic emotional suppression, unresolved grief, anxiety sensitivity, or rumination. At the same time, mindfulness-based approaches offer substantial benefits by cultivating acceptance, presence, and stress reduction, which may provide a stable foundation for long-term emotional and physiological regulation. These complementary strengths indicate that a combined or sequential approach integrating both therapeutic models may offer even greater benefits for cardiac patients, a direction that warrants further investigation.

Ultimately, the present study contributes to the growing body of literature emphasizing the role of psychological interventions in improving physiological outcomes among individuals with cardiovascular diseases. The significant reductions in heart rate reflect meaningful changes in autonomic functioning, emotional regulation, and psychophysiological health, and they highlight the importance of addressing emotional and attentional processes as part of comprehensive cardiac care. These findings further validate the integration of mindfulness-based and emotion-focused therapies within multidisciplinary cardiac rehabilitation frameworks, offering promising insights for clinicians, researchers, and health policymakers seeking to enhance cardiovascular treatment outcomes through evidence-based psychological approaches.

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 cardiac populations. The study relied on short-term posttest measurements, making it difficult to determine whether the observed reductions in heart rate were maintained over time. Additionally, although random assignment was used, the study design was quasi-experimental, and some uncontrolled variables—such as medication adherence, lifestyle habits, or external stressors—may have influenced the outcomes. Another limitation is that heart rate was the primary physiological indicator examined, whereas additional indicators such as heart rate variability, blood pressure, and cortisol levels could have provided a more comprehensive assessment of physiological change. Finally, the interventions were administered by a trained therapist, and therapist effects may have influenced the outcomes.

Future studies should include larger and more diverse samples to enhance generalizability and statistical power. Longitudinal designs with extended follow-up assessments would help determine the durability of treatment effects over time. Future research should also compare the effectiveness

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of combined mindfulness and emotion-focused interventions, as integrating attentional regulation with emotional processing may yield synergistic benefits. Additionally, incorporating more physiological measures—such as HRV, inflammatory markers, and neuroendocrine indicators—would provide richer insight into the biological mechanisms underlying therapeutic change. Studies comparing different delivery formats, such as online, hybrid, or group vs. individual therapy formats, may also be valuable in expanding accessibility for cardiac patients. Finally, qualitative research exploring patient experiences could deepen understanding of therapeutic engagement and perceived benefits.

Clinicians working with cardiac patients may consider incorporating mindfulness-based and emotion-focused techniques into routine cardiac rehabilitation programs. Emotion-focused strategies may be particularly beneficial for patients experiencing chronic emotional suppression, unresolved emotional distress, or significant anxiety, while mindfulness practices can support stress reduction and promote sustained emotional balance. Healthcare providers may also benefit from interdisciplinary collaboration between cardiologists, psychologists, and rehabilitation specialists to deliver integrated treatment plans. The use of simple physiological monitoring tools such as pulse oximeters can enhance patient awareness of their emotional–physiological responses and support greater self-regulation in daily life.

Authors' Contributions

Authors contributed equally to this article.

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.

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Declaration of Interest

The authors report no conflict of interest.

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Ethical Considerations

The study protocol adhered to the principles outlined in the Helsinki Declaration, which provides guidelines for ethical research involving human participants.

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