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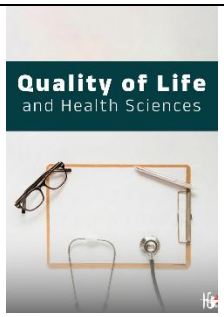

Health Anxiety and Quality of Life Among Patients With Cardiovascular Disease: The Mediating Role of Emotion Regulation Difficulties

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A B S T R A C T

Objective: This study aimed to investigate the relationship between health anxiety and quality of life among patients with cardiovascular disease and to examine the mediating role of emotion regulation difficulties in this relationship.
Methods and Materials: This descriptive-correlational cross-sectional study was conducted on 312 patients with cardiovascular disease who were receiving outpatient cardiology follow-up or cardiac rehabilitation services in Germany. Participants were selected through purposive sampling based on the inclusion and exclusion criteria. Data were collected using a demographic and clinical information form, the Short Health Anxiety Inventory, the Difficulties in Emotion Regulation Scale, and the MacNew Heart Disease Health-Related Quality of Life Questionnaire. Data were analyzed using SPSS and AMOS. Pearson correlation coefficients were used to examine relationships among variables, and path analysis was conducted to test the mediation model. The significance of the indirect effect was assessed using the bootstrapping method with 5,000 resamples and 95% confidence intervals.
Findings: Health anxiety was significantly and positively correlated with emotion regulation difficulties ($r = 0.58$, $p < .01$) and significantly and negatively correlated with quality of life ($r = -0.49$, $p < .01$). Emotion regulation difficulties were also significantly and negatively correlated with quality of life ($r = -0.62$, $p < .01$). The mediation model showed acceptable fit indices ($\chi^2/df = 2.16$, CFI = 0.989, TLI = 0.963, RMSEA = 0.061, SRMR = 0.018). Health anxiety significantly predicted emotion regulation difficulties ($\beta = 0.56$, $p < .001$), and emotion regulation difficulties significantly predicted quality of life ($\beta = -0.47$, $p < .001$). The direct effect of health anxiety on quality of life remained significant ($\beta = -0.25$, $p < .001$). The indirect effect was also significant ($\beta = -0.27$, 95% CI [-0.042, -0.022]), indicating partial mediation.
Conclusion: Emotion regulation difficulties partially mediated the relationship between health anxiety and quality of life among patients with cardiovascular disease, suggesting that emotional dysregulation is an important psychological mechanism through which health anxiety may reduce perceived quality of life.
Keywords: *Health anxiety; Quality of life; Cardiovascular disease; Emotion regulation difficulties; Mediation; Cardiac patients*

1. Introduction

Cardiovascular disease remains one of the most significant chronic health conditions affecting adult populations worldwide, not only because of its association with mortality and recurrent medical complications, but also because of its profound impact on patients' psychological functioning, daily adaptation, and perceived quality of life.

Living with cardiovascular disease often requires continuous medical monitoring, lifestyle modification, medication adherence, and repeated confrontation with bodily symptoms that may be interpreted as signs of deterioration or recurrence. For many patients, cardiovascular disease is not experienced solely as a biological condition, but as a persistent source of uncertainty, vulnerability, and emotional strain. The clinical course of cardiac illness can heighten sensitivity to bodily sensations such as palpitations, chest discomfort, breathlessness, fatigue, and dizziness, all of which may become psychologically threatening when patients interpret them as indicators of acute danger. In this context, psychological variables such as anxiety, stress, emotional dysregulation, and maladaptive health-related beliefs are increasingly recognized as important determinants of health outcomes and quality of life among patients with chronic medical conditions, including cardiovascular disease (Bernad et al., 2025; He et al., 2024; Sauletzhanovna et al., 2024).

Health anxiety is particularly relevant in cardiovascular populations because it reflects persistent fear and preoccupation with the possibility of having, developing, or worsening a serious illness. Although a certain degree of concern about health may be adaptive in patients with cardiac disease, excessive health anxiety may become clinically burdensome when it leads to hypervigilance toward bodily sensations, catastrophic interpretation of normal physiological changes, repeated reassurance seeking, avoidance of activity, and increased dependence on medical confirmation. Cardiovascular patients may be especially vulnerable to health anxiety because the symptoms of cardiac disease can be sudden, ambiguous, and emotionally alarming. A patient who has experienced myocardial infarction, arrhythmia, or unstable angina may interpret even mild somatic cues as warning signs of imminent cardiac events. This pattern can intensify psychological distress and may reduce patients' confidence in their ability to function, exercise, engage in social roles, or maintain independence. Research on anxiety and cardiovascular outcomes has emphasized that anxiety symptoms are not merely emotional reactions to illness but may have predictive value for long-term cardiovascular adjustment and health-related consequences (Park et al., 2023; Sauletzhanovna et al., 2024).

The relationship between psychological distress and cardiovascular health is complex and multidirectional. Anxiety may contribute to physiological activation, sleep disturbance, reduced adherence to rehabilitation recommendations, avoidance of physical activity, and heightened symptom monitoring. At the same time, cardiovascular symptoms and medical uncertainty may intensify anxiety, creating a self-reinforcing cycle in which bodily sensations increase worry and worry increases perceived bodily threat. Studies focusing on anxiety, stress, and cardiovascular health have highlighted the importance of understanding emotional distress as part of cardiac care rather than as a separate or secondary issue (Bernad et al., 2025). In patients with coronary heart disease, the structure of depression and anxiety symptoms has also been examined in relation to quality of life, reflecting growing interest in symptom-level psychological mechanisms that may explain how mental health problems affect patient-reported outcomes (He et al., 2024). These findings suggest that psychological distress should be integrated into explanatory models of quality of life among cardiovascular patients.

Quality of life is a central outcome in cardiovascular disease because survival alone does not fully capture patients' lived experience of illness. Health-related quality of life includes physical functioning, emotional well-being, social participation, perceived vitality, and the ability to fulfill valued roles despite illness. Cardiovascular disease can compromise quality of life through physical limitations, medication side effects, fear of recurrence, reduced work capacity, sexual difficulties, social withdrawal, and uncertainty about the future. In chronic illness research, anxiety has repeatedly been linked to poorer quality of life, and this association is not confined to cardiovascular samples. Studies in other clinical populations have shown that anxiety-related distress can impair subjective well-being, increase service use, and intensify the perceived burden of illness (Dona et al., 2025; Marcondes et al., 2025). Evidence from chronic health conditions also indicates that anxiety, depression, psychological inflexibility, and health-related distress can meaningfully shape patients' perceptions of functioning and well-being (Zhang et al., 2024). Therefore, in cardiovascular disease, it is important to examine how health anxiety contributes to reduced quality of life and through which psychological mechanisms this relationship may occur.

One possible mechanism linking health anxiety to quality of life is difficulty in emotion regulation. Emotion regulation refers to the processes through which individuals identify, understand, accept, modulate, and respond to emotional experiences. Effective emotion regulation allows patients to tolerate distress, reinterpret threatening experiences, maintain goal-directed behavior, and engage in adaptive

coping. In contrast, emotion regulation difficulties may involve emotional avoidance, lack of emotional clarity, impulsive responses under distress, nonacceptance of negative emotions, and limited access to strategies for managing emotional arousal. When patients with cardiovascular disease experience bodily sensations as threatening, their ability to regulate fear, uncertainty, and distress may determine whether they respond adaptively or become trapped in a pattern of catastrophic worry and avoidance. Systematic work on emotion regulation and psychopathology has emphasized that emotion regulation processes are central to the development and maintenance of anxiety-related symptoms across populations (Zitzmann et al., 2024).

The mediating role of emotion regulation difficulties is theoretically plausible because health anxiety involves both cognitive and affective components. Patients with high health anxiety may not only think catastrophically about bodily symptoms but may also struggle to manage the emotional arousal triggered by those interpretations. When emotion regulation is impaired, illness-related worry may become more persistent, intrusive, and behaviorally disruptive. Patients may become less able to disengage from anxious thoughts, less capable of tolerating uncertainty, and more likely to avoid activities that could improve physical and social functioning. In this way, emotion regulation difficulties may translate health anxiety into poorer quality of life. Research across diverse samples has shown that emotion regulation is closely related to anxiety, stress responses, and psychological adjustment. For example, studies among perinatal women during the COVID-19 period have shown that self-compassion and emotional regulation are associated with anxiety, depression, and social anxiety, supporting the broader relevance of emotion regulation in anxiety-related conditions (Cutajar & Bates, 2025). Similarly, qualitative findings on help-seeking for perinatal depression and anxiety suggest that emotional experiences, perceived need, and decision-making processes are deeply intertwined when individuals attempt to manage psychological distress (Shen et al., 2024).

The COVID-19 pandemic further highlighted the importance of anxiety, emotional regulation, and quality of life in populations exposed to prolonged uncertainty. Although pandemic-related studies do not directly represent cardiovascular patients, they provide important evidence regarding how sustained health threats, uncertainty, and perceived vulnerability can intensify anxiety and alter well-being. Research among students, faculty, and staff demonstrated changes in health behavior and anxiety during the pandemic, emphasizing that health-related threat can reshape both emotional experience and daily functioning (Thiria et al., 2024). A comparative study of medical and non-medical students also showed meaningful relationships among quality of life, anxiety, and mindfulness during the pandemic, indicating that anxiety is strongly connected to perceived life quality under conditions of health-related stress (Sun & Zhang, 2024). In addition, findings from Greek dentistry and nursing students two years after the pandemic showed that stress, anxiety, depression, resilience, hope, and spiritual well-being remained relevant to adaptation in demanding academic and health-related contexts (Mangoulia et al., 2024). These studies collectively demonstrate that anxiety under conditions of perceived health threat may have broad implications for quality of life and psychological resilience.

Health anxiety and emotion regulation also intersect with behavioral patterns that can further affect quality of life. Anxiety may influence eating behavior, sleep quality, physical activity, social engagement, and help-seeking behavior. For example, emotional eating has been associated with symptoms of anxiety, depression, and stress, indicating that emotional distress can manifest through maladaptive coping behaviors (Silva et al., 2025). Stress has also been linked to sleep quality through psychological mediators such as rumination and social anxiety, suggesting that anxiety-related cognitive-emotional processes can disrupt restorative functioning (Zhang & Yan, 2024). These pathways are especially important for cardiovascular patients because sleep, diet, activity, and stress management are central to cardiac rehabilitation and long-term disease management. If patients with cardiovascular disease experience high health anxiety and poor emotional regulation, they may be more likely to engage in maladaptive coping patterns that indirectly worsen perceived quality of life and potentially complicate self-management.

The broader anxiety literature further supports the importance of examining mechanisms rather than only direct associations. Neuroticism and anxiety during the COVID-19 pandemic have been systematically reviewed, showing that vulnerability to anxiety is shaped by enduring psychological traits and contextual stressors (Regzedmaa et al., 2024). Pandemic-related trauma responses were also associated with general mental health symptomatology, COVID anxiety, and sociodemographic factors, suggesting that anxiety may produce both negative and adaptive responses depending on individual and contextual resources (Juranek

et al., 2025). These findings are relevant to cardiovascular patients because chronic cardiac illness similarly involves ongoing exposure to uncertainty, perceived threat, and the need for psychological adaptation. Patients differ in whether health-related fear motivates adaptive self-care or becomes a persistent source of impairment. Emotion regulation difficulties may help explain these differences by clarifying why some patients can manage illness-related concerns while others experience escalating anxiety and declining quality of life.

Intervention studies provide additional evidence that emotion regulation is not only a theoretical construct but a modifiable psychological process. Mindfulness and life-skills training have been shown to improve emotion regulation and anxiety symptoms among migrant children, indicating that regulation capacities can be strengthened through structured psychological intervention (Lan et al., 2024). Research on emotion beliefs, emotion regulation strategies, and test anxiety has also demonstrated that how individuals understand and regulate emotional states is associated with anxiety responses in evaluative situations (Shang et al., 2024). Emotional schema therapy has been reported to improve self-regulation and frustration tolerance in female students with exam anxiety, further supporting the relevance of emotion-focused therapeutic approaches for anxiety-related problems (Mousavi et al., 2024). Meaning-centered group therapy has also been examined in women with cancer experiencing death anxiety, suggesting that interventions targeting meaning, distress tolerance, and existential concerns may help individuals cope with serious illness-related fears (Talebi et al., 2024). Although these studies were conducted in different populations, they support the broader assumption that emotion regulation processes can influence anxiety and adaptation in health-threatening conditions.

Despite growing attention to anxiety and emotion regulation in various clinical and non-clinical populations, several gaps remain in relation to cardiovascular disease. First, many studies have examined general anxiety or depression, whereas fewer have focused specifically on health anxiety, which may be especially relevant for patients who live with cardiac symptoms and fear of recurrence. Second, quality of life is often treated as a direct outcome of disease severity or general psychological distress, while less attention is given to the emotional mechanisms that may explain why anxious patients experience poorer life quality. Third, emotion regulation difficulties have been widely studied in anxiety-related and developmental contexts, but their mediating role in the association between health anxiety and quality of life among cardiovascular patients requires further empirical clarification. This gap is clinically important because if emotion regulation difficulties explain part of the relationship between health anxiety and reduced quality of life, psychological interventions for cardiovascular patients should not focus only on reassurance or symptom education, but also on strengthening emotional awareness, distress tolerance, cognitive flexibility, and adaptive regulation strategies.

In cardiovascular care, identifying psychological mediators can improve both assessment and intervention planning. A mediation model can show whether health anxiety is associated with quality of life directly, indirectly through emotion regulation difficulties, or both. If the indirect pathway is significant, it would suggest that patients with higher health anxiety may experience poorer quality of life partly because they have greater difficulty managing emotional distress. Such evidence would support integrated cardiac care models that include screening for health anxiety and emotion regulation problems alongside medical evaluation. It would also help clinicians identify patients who may benefit from psychological interventions focused on emotional coping, mindfulness, acceptance, self-regulation, and distress tolerance. Given the burden of cardiovascular disease and the importance of patient-reported outcomes, examining this pathway can contribute to a more comprehensive understanding of how psychological processes shape quality of life in cardiac populations.

Therefore, this study aimed to investigate the relationship between health anxiety and quality of life among patients with cardiovascular disease and to examine the mediating role of emotion regulation difficulties in this relationship.

2. Methods and Materials

2.1. Study Design and Participants

This study was designed as a descriptive-correlational and cross-sectional study with a mediation model to examine the relationship between health anxiety and quality of life among patients with cardiovascular disease, with emotion regulation difficulties considered as the mediating variable. The study population consisted of adult patients diagnosed with cardiovascular disease who were receiving outpatient or follow-up care in cardiology clinics and cardiac rehabilitation centers in Germany. A total of 312 patients participated in the study. Participants were recruited from

cardiology departments and affiliated outpatient centers in Berlin, Munich, and Hamburg using purposive sampling based on the inclusion and exclusion criteria. The inclusion criteria were being 18 years of age or older, having a confirmed medical diagnosis of cardiovascular disease such as coronary artery disease, heart failure, arrhythmia, myocardial infarction history, or hypertensive heart disease, having at least three months elapsed since diagnosis, being able to read and understand German, and providing informed consent to participate in the study. The exclusion criteria were the presence of severe cognitive impairment, acute psychiatric crisis, current hospitalization in an intensive care unit, severe neurological disorder, or incomplete responses to the main study questionnaires. Before data collection, the purpose of the study, voluntary nature of participation, confidentiality of information, and the right to withdraw at any stage were explained to all participants. Written informed consent was obtained from all participants, and the study was conducted in accordance with ethical principles for research involving human participants.

2.2. Measures

Data were collected using a demographic and clinical information form, the Short Health Anxiety Inventory, the Difficulties in Emotion Regulation Scale, and a cardiovascular disease-related quality of life questionnaire. The demographic and clinical information form was developed by the researchers to record age, gender, marital status, educational level, employment status, type of cardiovascular disease, duration of illness, history of hospitalization, medication use, comorbid chronic diseases, and participation in cardiac rehabilitation programs. This information was used to describe the sample and to control for selected clinical and demographic variables in the statistical analysis.

Health anxiety was assessed using the Short Health Anxiety Inventory. This instrument measures excessive worry about health, fear of having or developing a serious illness, sensitivity to bodily sensations, and illness-related preoccupation. The questionnaire is suitable for both clinical and non-clinical populations and is widely used in studies examining anxiety related to physical health conditions. Items are scored on a Likert-type scale, with higher total scores indicating greater levels of health anxiety. In the present study, the German version of the scale was used, and the total score was calculated according to standard scoring procedures. The internal consistency of the instrument was examined in the present sample using Cronbach's alpha coefficient.

Emotion regulation difficulties were measured using the Difficulties in Emotion Regulation Scale. This scale assesses multiple aspects of emotion regulation problems, including nonacceptance of emotional responses, difficulty engaging in goal-directed behavior when distressed, impulse control difficulties, limited access to effective emotion regulation strategies, lack of emotional clarity, and reduced emotional awareness. Participants responded to items using a Likert-type response format, and higher scores indicated greater difficulty in regulating emotions. In this study, the German version of the scale was used to evaluate the mediating variable. The total score was used in the main mediation analysis, and the reliability of the scale was evaluated through internal consistency analysis.

Quality of life was assessed using the MacNew Heart Disease Health-Related Quality of Life Questionnaire. This instrument is specifically designed to measure quality of life in patients with cardiovascular disease and evaluates physical, emotional, and social dimensions of health-related quality of life. Items are scored on a Likert-type scale, and higher scores indicate better perceived quality of life. The questionnaire is appropriate for patients with various cardiovascular conditions, including coronary artery disease, myocardial infarction, and heart failure. In the present study, the German version of the questionnaire was administered, and the total quality of life score was used as the primary outcome variable. The reliability of the instrument in the current sample was assessed using Cronbach's alpha coefficient.

2.3. Data Analysis

Data analysis was performed using SPSS and AMOS statistical software. Before conducting the main analyses, the dataset was screened for missing values, outliers, normality, and accuracy of data entry. Cases with substantial missing data were excluded from the final analysis, while minor missing values were managed using appropriate statistical procedures. Descriptive statistics, including mean, standard deviation, frequency, and percentage, were used to describe demographic and clinical characteristics of the participants and the main study variables. The internal consistency of the questionnaires was assessed using Cronbach's alpha coefficient. The normality of the variables was examined through skewness and kurtosis values, and the relationships among health anxiety, emotion regulation

difficulties, and quality of life were examined using Pearson correlation coefficients.

To test the hypothesized mediation model, path analysis was conducted in which health anxiety was entered as the independent variable, emotion regulation difficulties as the mediating variable, and quality of life as the dependent variable. Age, gender, disease duration, and number of comorbid chronic conditions were considered as control variables because of their potential association with quality of life among patients with cardiovascular disease. The direct effect of health anxiety on quality of life, the effect of health anxiety on emotion regulation difficulties, the effect of emotion regulation difficulties on quality of life, and the indirect effect of health anxiety on quality of life through emotion regulation difficulties were estimated. The significance of the indirect effect was tested using the bootstrapping method with 5,000 resamples and 95% confidence intervals. The mediating effect was considered statistically significant when the confidence interval did not include zero. Model fit was evaluated using standard fit indices, including the chi-square statistic, comparative fit index, Tucker–Lewis index, root mean square error of approximation, and standardized root mean square residual. A significance level of $p < .05$ was considered for all statistical tests.

3. Findings and Results

The final sample consisted of 312 patients with cardiovascular disease who were receiving outpatient cardiology follow-up or cardiac rehabilitation services in Germany. The participants ranged in age from 34 to 82 years, with a mean age of 61.43 years and a standard deviation of 10.87 years. Of the total participants, 174 patients were male and 138 were female, representing 55.8% and 44.2% of the sample, respectively. With regard to marital status, 216 participants were married or living with a partner, 48 were single, 31 were divorced or separated, and 17 were widowed. In terms of educational level, 64 participants had completed lower secondary education, 118 had completed upper secondary or vocational education, 91 held a university degree, and 39 reported postgraduate education. The most frequently reported cardiovascular diagnosis was coronary artery disease, reported by 128 participants, followed by hypertension-related cardiac disease in 67 participants, heart failure in 52 participants, arrhythmia in 39 participants, and a previous myocardial infarction as the primary clinical history in 26 participants. The mean duration of cardiovascular disease was 6.74 years with a standard deviation of 5.18 years. A total of 197 participants reported at least one additional chronic condition, most commonly type 2 diabetes, chronic kidney disease, dyslipidemia, or obesity. Overall, the demographic and clinical profile of the sample indicated that the study included a clinically heterogeneous group of adult patients with established cardiovascular disease, which provided an appropriate basis for examining psychological and quality-of-life variables in this population.

Table 1

Descriptive Statistics, Distribution Indices, and Internal Consistency of the Main Study Variables

Variable	Possible range	Observed range	Mean	SD	Skewness	Kurtosis	Cronbach's alpha
Health anxiety	0–54	4–47	22.84	8.91	0.38	-0.41	0.89
Emotion regulation difficulties	36–180	43–164	96.72	24.35	0.27	-0.36	0.93
Quality of life	1–7	1.82–6.71	4.61	1.02	-0.31	-0.28	0.94

Table 1 presents the descriptive statistics, distribution indices, and internal consistency coefficients for the main variables of the study. The mean score of health anxiety was 22.84, indicating that, on average, participants reported a moderate level of anxiety and preoccupation related to their health condition. The observed range of health anxiety scores showed sufficient variability among patients, suggesting that the sample included individuals with both low and elevated levels of health-related worry. The mean score for emotion regulation difficulties was 96.72, reflecting a moderate level of difficulty in accepting emotional responses, controlling impulses under distress, maintaining goal-directed behavior, and accessing effective strategies for emotional regulation. The mean quality of life score was 4.61 on the cardiovascular disease-related quality-of-life scale, indicating a moderate level of perceived quality of life among the participants. The skewness and kurtosis values for all three variables were within the acceptable range of -2 to +2, supporting the assumption of approximate normality for the main variables. In addition, the Cronbach's

alpha coefficients ranged from 0.89 to 0.94, demonstrating good to excellent internal consistency for all instruments used in the study. These results indicate that the measures were reliable and suitable for subsequent correlational and mediation analyses.

Table 2

Pearson Correlation Matrix Among Demographic, Clinical, and Psychological Variables

Variable	1	2	3	4	5	6
1. Age	1					
2. Disease duration	0.29**	1				
3. Number of comorbid conditions	0.36**	0.25**	1			
4. Health anxiety	0.16**	0.12*	0.24**	1		
5. Emotion regulation difficulties	0.14*	0.10	0.20**	0.58**	1	
6. Quality of life	-0.21**	-0.18**	-0.30**	-0.49**	-0.62**	1

Table 2 shows the bivariate correlations among age, disease duration, number of comorbid conditions, health anxiety, emotion regulation difficulties, and quality of life. Health anxiety was significantly and positively correlated with emotion regulation difficulties, indicating that patients who reported higher levels of illness-related worry, bodily preoccupation, and fear of serious disease also tended to report greater difficulty in regulating emotional responses. Health anxiety was also significantly and negatively correlated with quality of life, suggesting that higher health anxiety was associated with poorer perceived physical, emotional, and social functioning. Emotion regulation difficulties had the strongest correlation with quality of life among the psychological variables, and this relationship was negative and statistically significant. This finding indicates that patients who experienced greater problems in emotional awareness, emotional clarity, impulse control, and access to adaptive regulation strategies tended to report lower cardiovascular disease-related quality of life. Age, disease duration, and number of comorbid conditions were also negatively associated with quality of life, although their correlations were weaker than those observed for the psychological variables. These results supported the conceptual basis of the mediation model by demonstrating significant associations among the independent variable, mediator, and dependent variable.

Table 3

Model Fit Indices for the Mediation Model

Fit index	Obtained value	Recommended criterion	Interpretation
Chi-square	8.63	Non-significant preferred	Acceptable
df	4	—	—
p-value	0.071	$p > .05$ preferred	Acceptable
χ^2/df	2.16	< 3.00	Good fit
CFI	0.989	≥ 0.90	Excellent fit
TLI	0.963	≥ 0.90	Good fit
RMSEA	0.061	≤ 0.08	Acceptable fit
SRMR	0.018	≤ 0.08	Excellent fit

Table 3 presents the fit indices for the proposed mediation model in which health anxiety was entered as the predictor, emotion regulation difficulties as the mediator, and quality of life as the outcome variable, while age, disease duration, gender, and number of comorbid conditions were controlled. The chi-square statistic was not statistically significant, indicating that the difference between the observed covariance matrix and the model-implied covariance matrix was not substantial. The ratio of chi-square to degrees of freedom was 2.16, which was below the recommended threshold of 3.00 and therefore indicated acceptable model fit. The comparative fit index was 0.989 and the Tucker–Lewis index was 0.963, both of which exceeded the conventional criterion of 0.90 and demonstrated strong comparative fit. The root mean square error of approximation was 0.061, indicating acceptable approximation error, and the standardized root mean square residual was 0.018, showing a very low residual discrepancy between observed and predicted correlations. Taken together, these fit indices demonstrated that the hypothesized

mediation model provided an adequate and statistically acceptable representation of the relationships among health anxiety, emotion regulation difficulties, and quality of life among patients with cardiovascular disease.

Table 4

Standardized and Unstandardized Direct Path Coefficients in the Mediation Model

Path	B	SE	β	t	p
Health anxiety → Emotion regulation difficulties	1.54	0.12	0.56	12.84	< .001
Emotion regulation difficulties → Quality of life	-0.020	0.002	-0.47	-8.92	< .001
Health anxiety → Quality of life	-0.029	0.006	-0.25	-4.85	< .001
Age → Quality of life	-0.010	0.004	-0.11	-2.48	.013
Disease duration → Quality of life	-0.017	0.007	-0.09	-2.23	.026
Number of comorbid conditions → Quality of life	-0.118	0.036	-0.14	-3.31	.001
Gender → Quality of life	0.061	0.073	0.03	0.84	.402

Table 4 shows the direct path coefficients of the mediation model. Health anxiety had a significant positive effect on emotion regulation difficulties, indicating that higher levels of health anxiety were associated with greater difficulty in regulating emotions. This path had a relatively strong standardized coefficient, suggesting that health anxiety was an important psychological predictor of emotion regulation problems among patients with cardiovascular disease. Emotion regulation difficulties had a significant negative effect on quality of life, demonstrating that greater emotional dysregulation was associated with poorer perceived quality of life. The direct path from health anxiety to quality of life also remained statistically significant after emotion regulation difficulties were included in the model, indicating that health anxiety was directly associated with reduced quality of life even when the mediating role of emotion regulation difficulties was considered. Among the control variables, age, disease duration, and number of comorbid conditions were significant negative predictors of quality of life, whereas gender was not significantly associated with quality of life. These findings indicate that both psychological and clinical factors contributed to quality of life among patients with cardiovascular disease, but the strongest psychological pathway involved the effect of health anxiety on quality of life through increased emotion regulation difficulties.

Table 5

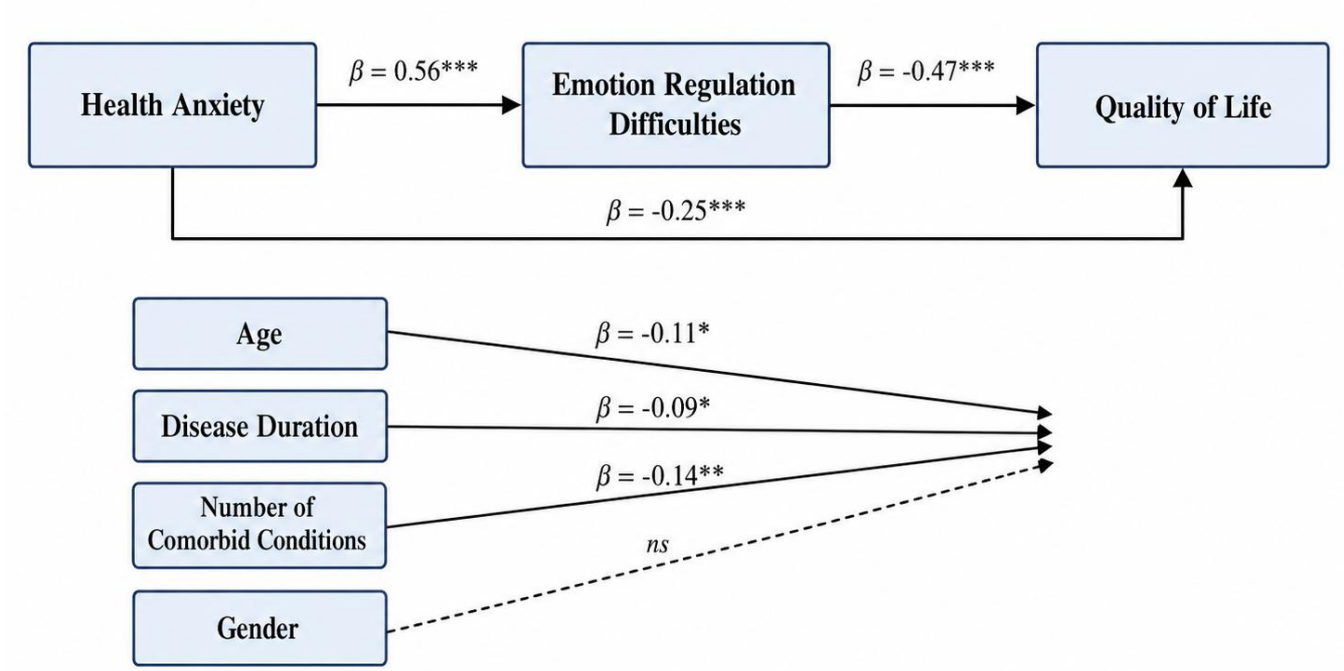
Bootstrapped Indirect, Direct, and Total Effects of Health Anxiety on Quality of Life Through Emotion Regulation Difficulties

Effect	B	SE	β	95% bootstrap CI	p
Total effect of health anxiety on quality of life	-0.060	0.006	-0.52	-0.072 to -0.048	< .001
Direct effect of health anxiety on quality of life	-0.029	0.006	-0.25	-0.041 to -0.017	< .001
Indirect effect through emotion regulation difficulties	-0.031	0.005	-0.27	-0.042 to -0.022	< .001
Proportion of total effect mediated	51.7%	—	—	—	—

Table 5 presents the results of the bootstrapping analysis used to test the mediating role of emotion regulation difficulties in the relationship between health anxiety and quality of life. The total effect of health anxiety on quality of life was negative and statistically significant, confirming that higher health anxiety was associated with lower quality of life before the mediator was included in the model. After emotion regulation difficulties were added to the model, the direct effect of health anxiety on quality of life remained statistically significant but was reduced in magnitude. This reduction indicates partial mediation rather than full mediation. The indirect effect of health anxiety on quality of life through emotion regulation difficulties was also statistically significant, as the 95% bootstrap confidence interval did not include zero. The negative indirect effect indicates that higher health anxiety was associated with greater emotion regulation difficulties, which in turn predicted lower quality of life. The mediation analysis showed that 51.7% of the total effect of health anxiety on quality of life was explained through emotion regulation difficulties. Therefore, emotion regulation difficulties served as a meaningful psychological mechanism linking health anxiety to reduced quality of life among patients with cardiovascular disease.

Figure 1

Standardized mediation model of the relationship between health anxiety and quality of life through emotion regulation difficulties



The standardized mediation model showed that health anxiety had a strong positive association with emotion regulation difficulties and a significant negative association with quality of life. Emotion regulation difficulties also had a significant negative association with quality of life, indicating that emotional dysregulation was an important explanatory pathway in the model. The figure illustrates that the relationship between health anxiety and quality of life was both direct and indirect. In other words, patients with greater health anxiety were more likely to report poorer quality of life not only because of the direct burden of excessive illness-related worry, but also because health anxiety was associated with greater difficulty managing emotional distress. This pattern supports the proposed mediating role of emotion regulation difficulties and suggests that quality of life in cardiovascular disease is influenced by the interaction of cognitive-affective health concerns and the capacity to regulate emotional responses effectively.

4. Discussion

The present study examined the relationship between health anxiety and quality of life among patients with cardiovascular disease and investigated whether emotion regulation difficulties mediated this relationship. The findings showed that patients reported moderate levels of health anxiety, moderate emotion regulation difficulties, and a moderate level of cardiovascular disease-related quality of life. The correlation analysis indicated that health anxiety was positively associated with emotion regulation difficulties and negatively associated with quality of life. Emotion regulation difficulties were also negatively associated with quality of life and showed the strongest bivariate association with the outcome variable. The mediation model demonstrated acceptable fit, and the path coefficients confirmed that health anxiety significantly predicted higher emotion regulation difficulties, while emotion regulation difficulties significantly predicted lower quality of life. The direct effect of health anxiety on quality of life remained significant after the mediator was included, but its magnitude was reduced, indicating partial mediation. The bootstrapped indirect effect was significant, showing that emotion regulation difficulties explained a substantial part of the relationship between health anxiety and quality of life.

The finding that health anxiety was negatively associated with quality of life is consistent with the broader literature showing that anxiety-related symptoms can impair subjective functioning, well-being, and adaptation in both clinical and non-clinical populations. In cardiovascular disease, health anxiety may be especially harmful because

the body itself becomes a constant source of perceived threat. Patients may interpret ordinary physiological changes, such as increased heart rate, fatigue, chest tightness, or shortness of breath, as signs of serious cardiac deterioration. This repeated threat interpretation may lead to avoidance of activity, excessive monitoring of symptoms, reassurance seeking, sleep disturbance, and reduced participation in social and occupational roles. The present findings are aligned with evidence indicating that anxiety and psychological distress are closely connected with cardiovascular outcomes and quality of life among patients with coronary heart disease and acute myocardial infarction (He et al., 2024; Sauletzhanovna et al., 2024). The results also correspond with evidence that mental disorders and anxiety-related conditions may increase cardiovascular risk and complicate long-term health trajectories, particularly when psychological distress is persistent and untreated (Park et al., 2023).

The negative association between health anxiety and quality of life can also be interpreted through the chronic uncertainty that accompanies cardiovascular disease. Patients with cardiovascular conditions often live with the possibility of recurrence, acute events, hospitalization, or functional decline. Therefore, health anxiety is not simply a general worry about illness; rather, it may be grounded in a realistic medical vulnerability that becomes maladaptive when fear is excessive, persistent, and behaviorally limiting. This interpretation is supported by work emphasizing the impact of stress and anxiety on cardiovascular health, including the role of psychological distress in shaping health-related outcomes (Bernad et al., 2025). In this context, high health anxiety may reduce quality of life by narrowing patients' attention to bodily danger, increasing perceived fragility, and weakening confidence in daily functioning. The finding is also compatible with studies showing that anxiety is associated with lower quality of life in other health-related conditions and populations, suggesting that anxiety can act as a transdiagnostic factor that diminishes perceived well-being across medical contexts (Dona et al., 2025; Marcondes et al., 2025; Zhang et al., 2024).

The present results also showed that health anxiety was strongly and positively associated with emotion regulation difficulties. This finding suggests that cardiovascular patients who experience greater illness-related worry also have more difficulty understanding, accepting, and managing their emotional responses. Health anxiety is often accompanied by fear, uncertainty, hypervigilance, catastrophic interpretation, and intolerance of bodily ambiguity. If patients lack effective emotion regulation capacities, these anxious responses may become more intense and persistent. Instead of recognizing anxiety as an emotional response that can be managed, patients may experience anxiety as evidence that something is medically wrong. This may create a feedback loop in which bodily sensations trigger anxiety, anxiety increases physiological arousal, and physiological arousal is then misinterpreted as further evidence of cardiac risk. The observed association is consistent with research showing that emotion regulation is closely linked to anxiety symptoms, emotional distress, and psychopathology across populations (Cutajar & Bates, 2025; Zitzmann et al., 2024).

The significant negative path from emotion regulation difficulties to quality of life was one of the most important findings of the study. Patients with greater emotion regulation difficulties reported poorer quality of life, even after health anxiety and clinical covariates were considered. This result indicates that the ability to manage emotional distress may be central to adaptation in cardiovascular disease. Patients who struggle to regulate emotions may find it difficult to maintain daily routines, engage in rehabilitation, communicate effectively with healthcare providers, tolerate uncertainty, or remain socially active despite illness. They may also be more vulnerable to rumination, avoidance, emotional exhaustion, and maladaptive coping behaviors. This interpretation is supported by studies showing that anxiety, mindfulness, and quality of life are interrelated and that psychological capacities such as mindfulness and emotional awareness may protect quality of life under stressful conditions (Sun & Zhang, 2024). It is also compatible with evidence that stress affects sleep quality through mediating psychological mechanisms such as rumination and social anxiety, suggesting that emotional and cognitive regulatory processes can shape functional outcomes (Zhang & Yan, 2024).

The mediation analysis provided evidence that emotion regulation difficulties partially mediated the relationship between health anxiety and quality of life. This means that health anxiety was associated with poorer quality of life both directly and indirectly through increased emotion regulation difficulties. The direct effect may reflect the immediate burden of excessive illness-related worry, fear of recurrence, symptom preoccupation, and reduced perceived safety. The indirect effect suggests that part of this burden operates through emotional dysregulation. In other words, patients

with high health anxiety may experience lower quality of life because they are less able to regulate the distress generated by illness-related thoughts and bodily sensations. This finding extends previous literature by identifying a psychological mechanism through which health anxiety may impair patient-reported outcomes in cardiovascular disease. It is consistent with studies indicating that emotional regulation influences anxiety, depression, and social anxiety, particularly in contexts of uncertainty and vulnerability (Cutajar & Bates, 2025; Shen et al., 2024).

The partial mediation pattern is clinically meaningful because it shows that emotion regulation difficulties did not fully explain the association between health anxiety and quality of life. This suggests that health anxiety has multiple pathways of influence. Some of its effect may occur through emotion regulation problems, while another part may operate through behavioral avoidance, excessive medical reassurance seeking, reduced activity, sleep disruption, perceived loss of control, or illness-related cognitive distortions. This interpretation is consistent with evidence from pandemic-related research showing that anxiety may influence well-being through multiple psychological and behavioral pathways, including health behavior changes, stress responses, and perceived threat (Juranek et al., 2025; Thiria et al., 2024). Similarly, research on neuroticism and anxiety during the COVID-19 pandemic indicates that anxiety is shaped by both individual vulnerability and situational stress, reinforcing the idea that anxiety-related impairment is rarely explained by one mechanism alone (Regzedmaa et al., 2024).

The results also showed that age, disease duration, and number of comorbid conditions were significant negative predictors of quality of life, whereas gender was not significant. These findings suggest that quality of life among cardiovascular patients is influenced not only by psychological factors but also by clinical burden and aging-related functional limitations. Older patients and those with longer disease duration may experience more accumulated physical limitations, medication burden, reduced exercise tolerance, or fear of clinical deterioration. Similarly, comorbid conditions may intensify fatigue, pain, disability, and healthcare demands, thereby reducing perceived quality of life. However, the psychological paths remained significant even after controlling for these variables, indicating that health anxiety and emotion regulation difficulties contribute to quality of life beyond demographic and clinical characteristics. This finding supports the need to integrate psychological assessment into cardiovascular care rather than relying only on biomedical indicators of disease severity.

The findings are also consistent with intervention-oriented research showing that emotion regulation is modifiable and can be improved through structured psychosocial interventions. For example, mindfulness and life-skills training have been shown to improve emotion regulation and anxiety symptoms, suggesting that interventions targeting emotional awareness, distress tolerance, and adaptive coping may reduce anxiety-related impairment (Lan et al., 2024). Research on emotion beliefs and emotion regulation strategies has also shown that how individuals interpret and manage emotions is associated with anxiety responses, including in stressful performance situations (Shang et al., 2024). In addition, emotional schema therapy has been shown to improve self-regulation and frustration tolerance among individuals with anxiety-related problems, supporting the therapeutic relevance of targeting maladaptive emotional beliefs and regulation strategies (Mousavi et al., 2024). These findings support the clinical implication that cardiovascular patients with high health anxiety may benefit from interventions that go beyond symptom education and include emotion regulation training.

The present findings also correspond with research in serious illness contexts showing that anxiety may be connected with existential concerns, distress tolerance, and meaning-related processes. In patients with chronic or life-threatening illnesses, anxiety is often intensified by concerns about death, loss of independence, and uncertainty about the future. Studies on meaning-centered intervention for women with cancer and death anxiety suggest that strengthening distress tolerance and meaning-oriented coping can improve adaptation when patients face serious health threats (Talebi et al., 2024). Although cardiovascular disease differs from cancer in clinical course and treatment context, both conditions can confront patients with mortality awareness and uncertainty. Therefore, the present mediation finding may indicate that emotion regulation difficulties are one pathway through which illness-related fear becomes a broader impairment in quality of life. In cardiovascular care, helping patients regulate fear without denying genuine medical risk may be essential for improving psychological adjustment and daily functioning.

5. Conclusion

Overall, the findings support a biopsychosocial understanding of quality of life in cardiovascular disease.

While cardiovascular disease is rooted in biological pathology, patients' subjective quality of life is also shaped by cognitive-affective responses to illness, emotional regulation capacities, and the ability to maintain adaptive functioning under uncertainty. The significant mediation effect indicates that emotion regulation difficulties are not merely associated with health anxiety and quality of life, but may represent a central explanatory mechanism linking the two. This supports the inclusion of emotion regulation assessment in routine psychosocial screening for cardiovascular patients. Patients with high health anxiety and poor regulation capacities may constitute a particularly vulnerable subgroup who require more comprehensive psychological support. Accordingly, the findings contribute to the literature by showing that emotion regulation difficulties partially explain why health anxiety is associated with poorer quality of life among patients with cardiovascular disease.

6. Limitations & Suggestions

This study had several limitations that should be considered when interpreting the findings. First, the cross-sectional design prevents causal conclusions about the relationships among health anxiety, emotion regulation difficulties, and quality of life. Although the mediation model was theoretically grounded, the temporal order of variables cannot be definitively established without longitudinal data. Second, all psychological variables were measured using self-report instruments, which may be influenced by response bias, social desirability, recall limitations, or current mood state. Third, the sample was recruited from selected cardiology clinics and rehabilitation centers in Germany, which may limit the generalizability of the findings to patients in other healthcare systems, rural settings, inpatient units, or culturally different contexts. Fourth, cardiovascular disease was treated as a broad clinical category, and although diagnosis type and disease duration were recorded, the analysis did not separately examine whether the mediation model differed across specific cardiac conditions such as heart failure, coronary artery disease, arrhythmia, or post-myocardial infarction status. Finally, the study did not include objective clinical indicators such as ejection fraction, disease severity classification, laboratory values, medication adherence, or physical activity level, which could have provided a more comprehensive understanding of quality of life.

Future studies should use longitudinal and prospective designs to clarify the temporal and causal relationships among health anxiety, emotion regulation difficulties, and quality of life in cardiovascular populations. Researchers should examine whether health anxiety predicts later emotion regulation problems and whether these difficulties subsequently predict changes in quality of life over time. Future studies may also compare different cardiovascular diagnostic groups to determine whether the mediation model is stronger among patients with more severe disease, recent cardiac events, repeated hospitalization, or high symptom burden. It would also be useful to include objective clinical indicators, behavioral variables, and treatment adherence measures to examine how psychological mechanisms interact with medical and lifestyle factors. In addition, future research should test more complex models that include other potential mediators and moderators, such as illness perception, intolerance of uncertainty, social support, mindfulness, depression, sleep quality, physical activity avoidance, and perceived self-efficacy. Experimental and intervention studies are also needed to determine whether improving emotion regulation can reduce health anxiety and improve quality of life among cardiovascular patients.

The findings suggest that healthcare professionals working with cardiovascular patients should pay close attention to health anxiety and emotion regulation difficulties as clinically relevant factors associated with quality of life. Routine psychological screening in cardiology clinics and cardiac rehabilitation programs can help identify patients who experience excessive illness-related worry, catastrophic interpretation of bodily sensations, and difficulty managing emotional distress. Psychological support for these patients should include psychoeducation about health anxiety, training in emotion regulation skills, strategies for tolerating uncertainty, relaxation and breathing techniques, cognitive restructuring of catastrophic symptom interpretations, and gradual re-engagement in valued activities. Multidisciplinary care involving cardiologists, nurses, psychologists, and rehabilitation specialists may be especially useful for patients whose emotional distress interferes with treatment adherence or daily functioning. By addressing both health anxiety and emotion regulation difficulties, clinical teams may improve not only emotional well-being but also patients' confidence, self-management, rehabilitation participation, and overall quality of life.

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Declaration of Interest

The authors of this article declared no conflict of interest.

Ethical Considerations

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

Transparency of Data

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

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Authors' Contributions

All authors equally contributed to this article.

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