

Illness Perceptions and Psychological Distress in Patients with Heart Disease: A Structural Equation Modeling Study Informed by Leventhal's Self-Regulation Model

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Abstract

Background

Psychological distress significantly impacts clinical outcomes in cardiac populations, yet the structural pathways from cognitive illness representations to psychological outcomes remain under-explored. Guided by Leventhal's Common-Sense Model of Self-Regulation, this study examined the structural pathways linking illness perceptions to anxiety and depressive symptoms in patients with heart disease.

Methods

This cross-sectional study included 264 elderly cardiac patients (mean age: 69.83 ± 7.80 years) in Iran. Data were collected using the Brief Illness Perception Questionnaire (Brief-IPQ) and the Hospital Anxiety and Depression Scale (HADS). Hypothesized pathways were examined using structural equation modeling (SEM).

Results

High prevalence rates of depressive (58.7%) and anxiety (54.5%) symptoms were observed. The structural model demonstrated excellent goodness-of-fit ($\chi^2/df = 1.92$, CFI = 0.958, TLI = 0.951, RMSEA = 0.058, SRMR = 0.045). Illness identity positively predicted both anxiety ($\beta = 0.183$, $p < .001$) and depression ($\beta = 0.204$, $p < .001$). Perceived consequences selectively predicted depression ($\beta = 0.238$, $p < .001$). Conversely, personal control functioned as a protective negative predictor for both anxiety ($\beta = -0.211$, $p < .001$) and depression ($\beta = -0.245$, $p < .001$). A significant positive correlation existed between latent anxiety and depression ($\beta = 0.298$, $p < .001$).

Conclusions

Illness representations function as distinct cognitive drivers of emotional distress. While symptom identity and perceived consequences amplify vulnerability, personal control acts as a critical protective buffer. Integrating cognitive reframing and control-enhancing strategies into cardiac patient care pathways may effectively mitigate psychological comorbidity.

Introduction

Cardiovascular diseases (CVDs) represent a formidable global health challenge, remaining the leading cause of mortality and disability worldwide. Recent data from the Global Burden of Disease study indicate that CVDs accounted for approximately 20.5 million deaths in 2021, with projections suggesting a continued escalation in the coming decades[1]. This rising burden is increasingly driven by demographic shifts, particularly population aging, which has become a primary determinant of CVD incidence globally[1, 2]. In Iran, the epidemiological landscape mirrors these global trends; the all-age prevalence of CVD has surged by over 180% since 1990, reaching an estimated 8.3 million cases[1]. Notably, decomposition analyses reveal that while age-standardized rates have shown some decline, the absolute number of cases continues to rise, primarily due to the 136% contribution of population aging to disease incidence[1]. Within this aging cohort, the complexity of managing heart disease is compounded by high rates of comorbidities; for instance, the prevalence of CVD among Iranians with type 2 diabetes is as high as 37.4%[3], and self-reported coronary heart disease affects nearly 10% of adults in regional cohorts, with risks significantly escalating in older age groups [4].

The impact of cardiac conditions extends beyond physiological impairment, frequently manifesting as significant psychological distress. Older patients, often facing multi-morbidity and age-related functional decline, are particularly vulnerable to the emotional burden of chronic illness[2, 5]. Global evidence indicates that the pooled prevalence of

depression among cardiac patients ranges from 20.8% to 31.3%, while anxiety affects approximately 32.9% of this population[5, 6]. This psychological comorbidity is not merely an associated symptom but a critical determinant of clinical outcomes, influencing treatment adherence, disease progression, and the overall quality of life[5]. Despite its clinical importance, psychological distress often remains under-recognized and under-treated in the context of cardiac care, particularly in aging populations where symptoms may be attributed to physical aging rather than emotional health [2, 6].

Leventhal's Common-Sense Model of Illness Self-Regulation (CSM/SRM) provides a comprehensive framework for understanding how individuals process and respond to health threats[7]. According to this model, patients develop cognitive and emotional representations of their illness across several dimensions, including identity (symptom perception), consequences, timeline, and personal or treatment control [7, 8]. These perceptions are particularly salient in older adults, whose representations of illness are often shaped by a lifetime of health experiences and age-related beliefs about vulnerability and recovery [8, 9]. Research suggests that these subjective interpretations significantly influence coping strategies and health-promoting behaviors; however, the cognitive processing of illness in older cardiac patients may differ from younger cohorts due to varying perceptions of disease consequences and control [9].

While the links between illness perceptions and psychological outcomes are established in general chronic disease literature, significant gaps remain regarding the structural relationships between these constructs in older cardiac populations, especially within the Middle Eastern context. Most previous studies have either focused on prevalence or utilized simpler regression models that cannot account for the simultaneous interplay between multiple latent dimensions of illness perception and distress. There is a lack of research employing advanced statistical techniques, such as Structural Equation Modeling (SEM), to map the pathways through which specific illness representations—such as perceived control or consequences—drive anxiety and depression in older Iranian patients with heart disease. Addressing this gap is essential for developing targeted psychosocial interventions that are tailored to the unique cognitive profiles of older cardiac patients.

The primary objective of this study is to investigate the association between illness representations (Identity, Consequences, and Control) and psychological distress (Anxiety and Depression) in an older sample of patients with heart disease using SEM. Specifically, this study aims to: (1) determine the prevalence of anxiety and depression in this population; (2) assess how individual dimensions of illness perception predict levels of psychological distress; and (3) test a structural model based on the CSM/SRM to elucidate the complex relationships between these variables.

Study design

This study employed a descriptive-analytical cross-sectional design with a correlational approach. Structural Equation Modeling (SEM) was used to test a hypothesized model of the relationships between illness perceptions and psychological distress.

Setting and participants

The study was conducted at Razi Hospital in Birjand, Iran, including the cardiology wards and the outpatient cardiology clinic. The target population consisted of adult patients with a physician-confirmed diagnosis of heart disease who attended the hospital for treatment or follow-up.

Sampling and sample size

Participants were recruited using convenience sampling. Eligible patients were enrolled sequentially based on their willingness to participate and fulfillment of the inclusion criteria. The final sample comprised 264 patients.

Eligibility criteria

Inclusion criteria included: a definitive diagnosis of heart disease by a cardiologist; age 18 years or older; and ability to understand and complete the questionnaires. Exclusion criteria included: less than 48 to 72 hours after an acute cardiac event; severe psychiatric or cognitive impairment that interfered with questionnaire completion; physical or cognitive disability to participate in the study; completion of less than 80% of the questionnaire items; severe trauma, surgery, or bereavement in the past month; current psychiatric treatment or use of psychotropic medications; and unwillingness to participate in the study.

Instruments

Data were collected using a demographic and clinical questionnaire, the Brief Illness Perception Questionnaire (BIPQ), and the Hospital Anxiety and Depression Scale (HADS).

The demographic and clinical questionnaire assessed age, sex, marital status, education, type and duration of heart disease, medication use, and relevant clinical history. In the final sample, the mean age of participants was 69.83 years (SD = 7.80), with a median of 68 years (IQR = 10).

The BIPQ is a self-report instrument based on Leventhal's Common-Sense Model of Self-Regulation. It consists of eight Likert-type items scored from 0 to 10, with higher scores indicating more threatening illness perceptions. For the structural model, the dimensions of illness identity (item 5), perceived consequences (item 1), and personal control (item 3) were operationalized based on the item mapping of the scale. The instrument consists of 9 items (8 scored items and 1 open-ended question), with a total score ranging from 0 to 80. Higher scores reflect a more negative or threatening perception of illness. Scores can be categorized as low (0–27), moderate (28–54), and high (55–80) [20]. The Brief Illness Perception Questionnaire (Brief-IPQ) was previously translated and culturally adapted for Iranian settings using accepted translation and validation procedures. Its reliability and construct validity have been confirmed in Iranian populations, with a reported Cronbach's alpha of 0.82. [10] In the present study, the Brief-IPQ demonstrated acceptable internal consistency (Cronbach's $\alpha = 0.73$).

The HADS consists of 14 items: 7 items assessing anxiety and 7 items assessing depression. Each item is scored on a 4-point scale from 0 to 3, giving a total score from 0 to 21 for each subscale. In this study, we utilized the validated Persian version of HADS developed by Montazeri et al. in 2003.[11] In the present sample, Cronbach's α was 0.84 for the HADS-Anxiety subscale and 0.88 for the HADS-Depression subscale.

Data collection procedure

consenting patients were selected using convenience sampling method from among those referred to the cardiac wards of Razi Hospital. The researcher explained the purpose and steps of the study, and written informed consent was obtained. The questionnaires were completed individually in a private setting. For participants with limited literacy, the researcher read the items aloud and recorded their responses. Each session lasted approximately 15 to 20 minutes. Data were collected in 2026 at Razi Hospital in Birjand, Iran.

Statistical analysis

Data were analyzed using IBM SPSS Statistics version 26. Descriptive statistics were used to summarize continuous variables (mean, SD, median, IQR) and categorical variables (frequency and percentage). Pearson correlation coefficients were calculated to examine bivariate associations between illness perceptions and psychological distress. Structural Equation Modeling was performed to test the hypothesized relationships between illness perception dimensions and psychological distress. Model fit was evaluated using multiple indices: the ratio of chi-square to degrees of freedom, the

Comparative Fit Index (CFI), the Tucker-Lewis Index (TLI), the Root Mean Square Error of Approximation (RMSEA), and the Standardized Root Mean Square Residual (SRMR). A two-tailed p value below 0.05 was considered statistically significant.

Results

This section presents the findings of the study, including sociodemographic and clinical characteristics, psychometric properties of the instruments, prevalence of psychological distress, and the results of the Structural Equation Modeling.

Sociodemographic and clinical characteristics

Among the 264 cardiac patients, depressive symptoms were present in 155 participants (58.7%), whereas anxiety symptoms were present in 144 participants (54.5%). No statistically significant differences were observed between participants with and without depressive symptoms regarding age, disease duration, or ejection fraction. Similarly, none of the examined sociodemographic or clinical characteristics was significantly associated with depressive symptoms. For anxiety symptoms, no statistically significant differences were found in continuous variables or categorical sociodemographic and clinical characteristics. Family history of heart disease showed a borderline association with anxiety symptoms ($p = .066$); however, this association did not reach the prespecified significance threshold of $p < .05$. These characteristics are summarized in Table 1.

Table 1
Sociodemographic and clinical characteristics according to depressive and anxiety symptoms

Variable	Depression: No (n = 109)	Depression: Yes (n = 155)	p value	Anxiety: No (n = 120)	Anxiety: Yes (n = 144)	p value
Age, mean $\pm$ SD	70.03 $\pm$ 7.87	69.49 $\pm$ 7.91	.587	69.43 $\pm$ 7.61	69.95 $\pm$ 8.13	.590
Disease duration, years, mean $\pm$ SD	6.61 $\pm$ 4.09	5.79 $\pm$ 4.11	.110	6.28 $\pm$ 3.67	6.01 $\pm$ 4.47	.594
Ejection fraction, %, mean $\pm$ SD	42.92 $\pm$ 11.16	43.86 $\pm$ 11.42	.507	43.88 $\pm$ 10.92	43.13 $\pm$ 11.64	.588
Sex			.146			.558
Male*	52 (47.7%)	88 (56.8%)		66 (55.0%)	74 (51.4%)	
Female*	57 (52.3%)	67 (43.2%)		54 (45.0%)	70 (48.6%)	
Marital status			.263			.452
Single	41 (37.6%)	69 (44.5%)		47 (39.2%)	63 (43.8%)	
Married	68 (62.4%)	86 (55.5%)		73 (60.8%)	81 (56.3%)	
University education			.792			.525
No	75 (68.8%)	109 (70.3%)		86 (71.7%)	98 (68.1%)	
Yes	34 (31.2%)	46 (29.7%)		34 (28.3%)	46 (31.9%)	
Place of residence			.084			.611
Urban	74 (67.9%)	120 (77.4%)		90 (75.0%)	104 (72.2%)	
Rural	35 (32.1%)	35 (22.6%)		30 (25.0%)	40 (27.8%)	
Tobacco use			.724			.828
No	73 (67.0%)	107 (69.0%)		81 (67.5%)	99 (68.8%)	
Yes	36 (33.0%)	48 (31.0%)		39 (32.5%)	45 (31.3%)	
Family history of heart disease			.499			.066
No	63 (57.8%)	96 (61.9%)		65 (54.2%)	94 (65.3%)	
Yes	46 (42.2%)	59 (38.1%)		55 (45.8%)	50 (34.7%)	
Previous PCI/CABG			.142			.329
No	88 (80.7%)	113 (72.9%)		88 (73.3%)	113 (78.5%)	
Yes	21 (19.3%)	42 (27.1%)		32 (26.7%)	31 (21.5%)	
Previous medication use			.396			.485
No	55 (50.5%)	70 (45.2%)		54 (45.0%)	71 (49.3%)	
Yes	54 (49.5%)	85 (54.8%)		66 (55.0%)	73 (50.7%)	
Type of heart disease			.532			.895
Footnote: Values are shown as mean $\pm$ SD or n (%). <i>p</i> values were obtained using independent-samples <i>t</i> tests or Pearson's chi-square tests, as appropriate. <i>p</i> < 0.05 was considered statistically significant.						

Variable	Depression: No (n = 109)	Depression: Yes (n = 155)	p value	Anxiety: No (n = 120)	Anxiety: Yes (n = 144)	p value
Coronary artery disease/ACS	29 (26.6%)	50 (32.3%)		38 (31.7%)	41 (28.5%)	
Heart failure	24 (22.0%)	27 (17.4%)		20 (16.7%)	31 (21.5%)	
Arrhythmia	15 (13.8%)	30 (19.4%)		22 (18.3%)	23 (16.0%)	
Valvular heart disease	13 (11.9%)	13 (8.4%)		11 (9.2%)	15 (10.4%)	
Cardiomyopathy	16 (14.7%)	23 (14.8%)		19 (15.8%)	20 (13.9%)	
Other	12 (11.0%)	12 (7.7%)		10 (8.3%)	14 (9.7%)	
Diabetes mellitus			.091			.925
No	65 (59.6%)	108 (69.7%)		79 (65.8%)	94 (65.3%)	
Yes	44 (40.4%)	47 (30.3%)		41 (34.2%)	50 (34.7%)	
Hypertension			.278			.074
No	44 (40.4%)	73 (47.1%)		46 (38.3%)	71 (49.3%)	
Yes	65 (59.6%)	82 (52.9%)		74 (61.7%)	73 (50.7%)	
Hyperlipidemia			.862			.769
No	60 (55.0%)	87 (56.1%)		68 (56.7%)	79 (54.9%)	
Yes	49 (45.0%)	68 (43.9%)		52 (43.3%)	65 (45.1%)	
Osteoarthritis			.955			.740
No	91 (83.5%)	129 (83.2%)		99 (82.5%)	121 (84.0%)	
Yes	18 (16.5%)	26 (16.8%)		21 (17.5%)	23 (16.0%)	
Footnote: Values are shown as mean $\pm$ SD or n (%). <i>p</i> values were obtained using independent-samples <i>t</i> tests or Pearson's chi-square tests, as appropriate. $p < 0.05$ was considered statistically significant.						

Among 264 cardiac patients with complete HADS data, 155 (58.7%) had depressive symptoms and 144 (54.5%) had anxiety symptoms, based on a HADS subscale cut-off score of ≥ 8 .

In bivariate logistic regression analyses, all eight illness perception dimensions were significantly associated with depressive symptoms. Higher perceived consequences, a longer perceived timeline, greater symptom identity, greater illness concern, and stronger emotional response were associated with increased odds of depressive symptoms (all $p \leq .005$). Conversely, higher personal control, treatment control, and illness comprehensibility were associated with lower odds of depressive symptoms (all $p \leq .003$).

For anxiety symptoms, higher perceived consequences (OR = 1.11, 95% CI: 1.01–1.22, $p = .034$), a longer perceived timeline (OR = 1.19, 95% CI: 1.07–1.32, $p = .001$), greater symptom identity (OR = 1.11, 95% CI: 1.01–1.21, $p = .035$), and stronger emotional response (OR = 1.12, 95% CI: 1.02–1.24, $p = .021$) were associated with higher odds of anxiety symptoms. In contrast, greater personal control (OR = 0.90, 95% CI: 0.82–0.99, $p = .025$) and treatment control (OR = 0.86, 95% CI: 0.78–0.95, $p = .004$) were associated with lower odds of anxiety symptoms. Illness concern and illness comprehensibility were not significantly associated with anxiety symptoms ($p = .059$ and $p = .060$, respectively). The results of the bivariate logistic regression analyses are summarized in Table 2.

Table 2

Bivariate associations of illness perception dimensions with depressive and anxiety symptoms among cardiac patients (N = 264)

Illness perception dimension	Total, Mean $\pm$ SD	Depression: No (n = 109)	Depression: Yes (n = 155)	OR (95% CI)	p-value	Anxiety: No (n = 120)	Anxiety: Yes (n = 144)	OR (95% CI)	p-value
Consequences	5.92 $\pm$ 2.61	5.21 $\pm$ 2.65	6.43 $\pm$ 2.47	1.20 (1.09–1.33)	< .001	5.55 $\pm$ 2.48	6.24 $\pm$ 2.68	1.11 (1.01–1.22)	.034
Timeline	5.71 $\pm$ 2.51	5.00 $\pm$ 2.56	6.21 $\pm$ 2.37	1.22 (1.10–1.35)	< .001	5.13 $\pm$ 2.38	6.19 $\pm$ 2.53	1.19 (1.07–1.32)	.001
Personal control	4.28 $\pm$ 2.61	4.86 $\pm$ 2.48	3.86 $\pm$ 2.64	0.86 (0.78–0.95)	.003	4.68 $\pm$ 2.60	3.94 $\pm$ 2.59	0.90 (0.82–0.99)	.025
Treatment control	4.06 $\pm$ 2.52	4.67 $\pm$ 2.39	3.63 $\pm$ 2.52	0.84 (0.76–0.94)	.001	4.56 $\pm$ 2.23	3.64 $\pm$ 2.67	0.86 (0.78–0.95)	.004
Identity	5.78 $\pm$ 2.64	5.24 $\pm$ 2.76	6.17 $\pm$ 2.48	1.15 (1.04–1.26)	.005	5.41 $\pm$ 2.63	6.10 $\pm$ 2.61	1.11 (1.01–1.21)	.035
Illness concern	5.88 $\pm$ 2.55	5.20 $\pm$ 2.45	6.35 $\pm$ 2.51	1.20 (1.09–1.33)	< .001	5.55 $\pm$ 2.42	6.15 $\pm$ 2.62	1.10 (1.00–1.21)	.059
Illness comprehensibility	4.22 $\pm$ 2.37	4.82 $\pm$ 2.38	3.81 $\pm$ 2.28	0.83 (0.74–0.93)	.001	4.53 $\pm$ 2.22	3.97 $\pm$ 2.46	0.91 (0.82–1.00)	.060
Emotional response	5.83 $\pm$ 2.50	5.16 $\pm$ 2.52	6.31 $\pm$ 2.38	1.21 (1.09–1.35)	< .001	5.44 $\pm$ 2.35	6.16 $\pm$ 2.58	1.12 (1.02–1.24)	.021
Note. Data are shown as mean $\pm$ SD or OR (95% CI). ORs were derived from separate univariate binary logistic regression models and represent the change in odds per one-unit increase in each BIPQ dimension. HADS-D $\geq$ 8 and HADS-A $\geq$ 8 defined depressive and anxiety symptoms, respectively.									

Structural Equation Modeling (SEM) and Hypothesis Testing

The structural equation model was evaluated to examine the direct paths from illness perception dimensions to anxiety and depression among cardiac patients. Table 3 presents the standardized and unstandardized path coefficients, standard errors, t-values, and p-values for the hypothesized structural relationships.

The structural paths demonstrated that illness perception dimensions significantly predicted psychological distress. Specifically, Identity (beta = 0.183, $p < .001$) and Personal Control (beta = -0.211, $p < .001$) were significant predictors of anxiety. For depression, significant paths were identified from Identity (beta = 0.204, $p < .001$), Consequences (beta = 0.238, $p < .001$), and Personal Control (beta = -0.245, $p < .001$). Furthermore, a significant positive correlation was observed between anxiety and depression (beta = 0.298, $p < .001$).

As summarized in Table 4, the final structural model exhibited excellent overall goodness-of-fit indices: chi-square/df = 1.92 (below the recommended threshold of < 3.0), CFI = 0.958, TLI = 0.951 (both exceeding the > 0.95 threshold for excellent fit), RMSEA = 0.058 (meeting the good fit criterion of < 0.06), and SRMR = 0.045 (well below the strict threshold of < 0.08).

Table 3
Path Coefficients and Hypothesis Testing (Structural Model)

Path	Standardized β	Unstandardized B	S.E.	t-value	p-value
BIPQ_Identity → Anxiety	0.183	0.412	0.096	4.29	< .001
BIPQ_Control → Anxiety	-0.211	-0.475	0.068	-6.98	< .001
BIPQ_Identity → Depression	0.204	0.456	0.093	4.90	< .001
BIPQ_Consequences → Depression	0.238	0.548	0.106	5.16	< .001
BIPQ_Control → Depression	-0.245	-0.551	0.071	-7.76	< .001
Anxiety ↔ Depression	0.298	—	—	—	< .001

Table 4
Model Fit Summary

Fit Index	Observed Value	Recommended Threshold	Interpretation
χ^2/df	1.92	< 3.0	Good
CFI	0.958	> 0.95	Excellent
TLI	0.951	> 0.95	Excellent
RMSEA	0.058	< 0.06	Good
SRMR	0.045	< 0.08	Excellent

Structural equation modeling

Based on Leventhal's Common-Sense Model, the structural model examined the effects of illness perception dimensions on anxiety and depression. Illness identity positively predicted anxiety and depression. Perceived consequences positively predicted depression. Personal control negatively predicted both anxiety and depression. The covariance between the latent anxiety and depression factors was positive and significant. The final model showed good fit, with a chi-square to degrees of freedom ratio of 1.92, CFI of 0.958, TLI of 0.951, RMSEA of 0.058 (90% CI, 0.048 to 0.067), and SRMR of 0.045. The final path diagram is presented in Fig. 1.

Principal Findings

This study tested a structural model based on Leventhal's Common-Sense Model to examine how specific dimensions of illness perception predict psychological distress in patients with heart disease. The sample had an older age profile, with a mean age of 69.83 years (SD = 7.80) and a median age of 68 years, making the findings particularly relevant to the care of older cardiac patients. The SEM results confirmed that illness perceptions are not merely descriptive labels but active cognitive processes that shape emotional outcomes. The model revealed a distinct functional architecture: whereas the illness identity and perceived consequences dimensions acted as risk factors, the personal control dimension functioned as a protective buffer.

Illness Perceptions in an Older Cardiac Population

The high age of our sample deserves specific consideration. Older adults with heart disease often face multimorbidity, functional decline, and accumulated losses, which may amplify the emotional impact of a threatening illness representation. In this context, the observed association between illness identity and both anxiety and depression suggests that perceiving a broad range of symptoms as attributable to the heart condition increases emotional vulnerability in later life. Likewise, the selective link between perceived consequences and depression may reflect an appraisal of life disruption that is particularly salient among older patients, who may perceive fewer opportunities for functional recovery. Conversely,

the protective role of personal control appears especially relevant in geriatric care: strengthening older patients' sense of control over their condition may buffer against the emotional burden of chronic cardiac illness. These findings underline the importance of integrating psychosocial assessment, including illness perception, into routine geriatric cardiology pathways.

Functional Pathways of the BIPQ Dimensions

The structural model demonstrates that different dimensions of illness perception follow distinct emotional pathways. The illness identity dimension—representing the extent to which patients attribute various symptoms to their condition—functioned as a broad driver of distress, positively predicting both anxiety and depression. This suggests that as the perceived identity of the illness expands, it intensifies emotional vulnerability across the entire spectrum of psychological distress.

In contrast, the perceived consequences dimension exhibited a more selective pathway, specifically reinforcing depressive symptoms. Within the CSM framework, this dimension captures the patient's appraisal of the life disruptions caused by the illness. Our model shows that the cognitive weight assigned to these consequences feeds directly into an emotional representation of loss, thereby specifically fueling depression rather than anxiety.

Conversely, the personal control dimension served as the primary inhibitory force within the model. This dimension, which reflects the patient's belief in their ability to manage the illness, negatively predicted both anxiety and depression. Effectively, personal control acts as a regulatory mechanism that mitigates the emotional impact of the other dimensions.

In summary, the structural configuration of our model reveals a clear functional pattern: illness identity amplifies both anxiety and depression, perceived consequences specifically reinforces depression, and personal control suppresses both.

Theoretical Integration

These findings provide empirical support for the core proposition of the CSM: that cognitive representations of illness precede and determine emotional responses. The model demonstrates that psychological distress in heart disease is not a monolithic state but is shaped by the specific configuration of the patient's perception profile. By identifying these distinct pathways, the model clarifies how different cognitive appraisals of a heart condition can lead to divergent emotional trajectories.

Clinical Implications

Targeted clinical interventions, based on these structural pathways, should prioritize the modulation of the perceived consequences dimension and the enhancement of the personal control dimension. Specifically, addressing these two modifiable dimensions offers the most efficient way to disrupt the pathways leading to psychological distress in cardiac patients. In older patients, such interventions should be integrated into geriatric care pathways, where cognitive reframing of illness consequences and strengthening perceived control—through education, shared decision-making, and self-management support—may be particularly effective.

Comparison with Existing Literature

The present study demonstrates that illness perceptions are significant drivers of psychological distress, a finding consistent with a robust body of international research. The significant predictive role of the illness identity dimension observed in our model aligns with results reported by Botti et al. [12] and Shabanloei et al [13], who established that patients attributing a wide range of physiological symptoms to their cardiac condition exhibit heightened emotional vulnerability, which suggests that the cognitive label (identity) serves as a primary stimulus for emotional arousal in chronic disease populations. This is consistent with the foundational theoretical framework proposed by Petrie and Weinman[14] and Moss-Morris[15], who identified symptom-related identity as a central component of the self-regulatory process.

The relevance of these associations may be particularly pronounced in older cardiac populations. In older veterans with heart failure, greater perceived illness intrusiveness and a more chance-oriented locus of control were associated with

higher depressive symptoms [16]. Consistent with this finding, studies have shown that among elderly patients with coronary heart disease, more threatening illness perceptions were independently associated with higher anxiety and depression [17]. Likewise, in patients with acute coronary syndrome, stronger perceived consequences were associated with depressive symptoms, whereas greater personal control was associated with lower odds of anxiety symptoms[18].

regarding the perceived consequences dimension, the selective association with depressive symptoms found in the present study corroborates the findings of Al-Sutari et al. [19] While these studies emphasized the impact of heart disease on mood, our structural model provides further clarity by demonstrating the specific pathway from “appraisal of loss” to depressive symptoms. This is supported by Steiner et al. [20] The results of Silvia et al.'s study showed that among breast cancer patients, higher appraisals of harm/loss and greater use of escape-avoidance coping strategies predicted higher depressive symptoms.[21]

Studies show that depressive symptoms in older adults are closely linked to psychological factors such as stress, as well as health-related factors, including cognitive status.[22]

Finally, the protective effect of the personal control dimension identified in the present study is supported by Hugger[23]. These studies have consistently demonstrated that a robust sense of perceived agency acts as a critical psychological buffer against the emotional rigors of chronic illness. Our results extend this understanding, explicitly mapping the functional inhibitory pathway through which the personal control dimension suppresses both anxiety and depression. Unlike earlier correlational studies[24], our structural model confirms that personal control is not merely associative but serves as a regulatory mechanism likehood some other research[25]. Furthermore, evidence from intervention-based research suggests that enhancing this sense of mastery is a clinically relevant goal for improving psychological outcomes in clinical care[26–29].

Limitations

This study has several limitations. First, its cross-sectional design does not allow causal inferences. Second, participants were recruited by convenience sampling from a single center, which may limit generalizability. Third, the use of self-report measures may have introduced response bias, and anxiety and depression were assessed as symptoms rather than clinical diagnoses. Finally, the heterogeneous cardiac diagnoses and the omission of some potentially relevant clinical and psychosocial variables may have influenced the observed associations.

Conclusion

This study indicates that illness perceptions are significantly associated with psychological distress among patients with heart disease. The structural model showed that stronger illness identity was related to higher anxiety and depressive symptoms, whereas greater perceived consequences were particularly associated with depression. In contrast, higher personal control was associated with lower levels of both anxiety and depression.

These findings support the Common-Sense Model of Self-Regulation by suggesting that cognitive representations of heart disease are closely linked to patients’ emotional adjustment. In cardiac populations with an older age profile, perceptions of symptoms, anticipated consequences, and personal ability to manage illness may be especially relevant because of the potential coexistence of multimorbidity, functional limitations, and recurrent healthcare use.

Routine assessment of illness perceptions may help identify patients who experience more threatening views of their cardiac condition and who may be vulnerable to psychological distress. Nevertheless, prospective research is needed to clarify causal pathways, assess changes in illness perceptions over time, and determine whether addressing maladaptive illness beliefs is associated with improved psychological outcomes in diverse cardiac populations.

Declarations

CRedit authorship contribution statement

FL: was involved in conceptualizing, Resource, Validation, Methodology,

Visualization, Data curation, Investigation, and also Writing – original draft the manuscript.

SA: was involved in conceptualizing, Investigation, Project administration, Data analysis,

Resources, Supervision, Validation, Visualization and also Writing – review & editing, the manuscript.

EA: assisted with the conceptualization, Validation, Writing – review & editing, Data analysis.

NA: was involved in conceptualizing, Resources, Validation, Visualization and also Writing – review & editing, the manuscript

Ethics Committee Approval

The study was conducted in accordance with the ethical principles of the World Medical Association as set out in the Declaration of Helsinki. The study was approved by the local ethics committee of Birjand University of Medical Sciences with number IR.BUMS.REC.1404.511. All study participants provided informed consent to participate. Participants' data were stored in an anonymized form. The manuscript does not provide individual data that would allow identification of the study participants.

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Competing interests: Authors declare no competing interests.

Data availability

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Consent for publication :Not applicable.

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Figures

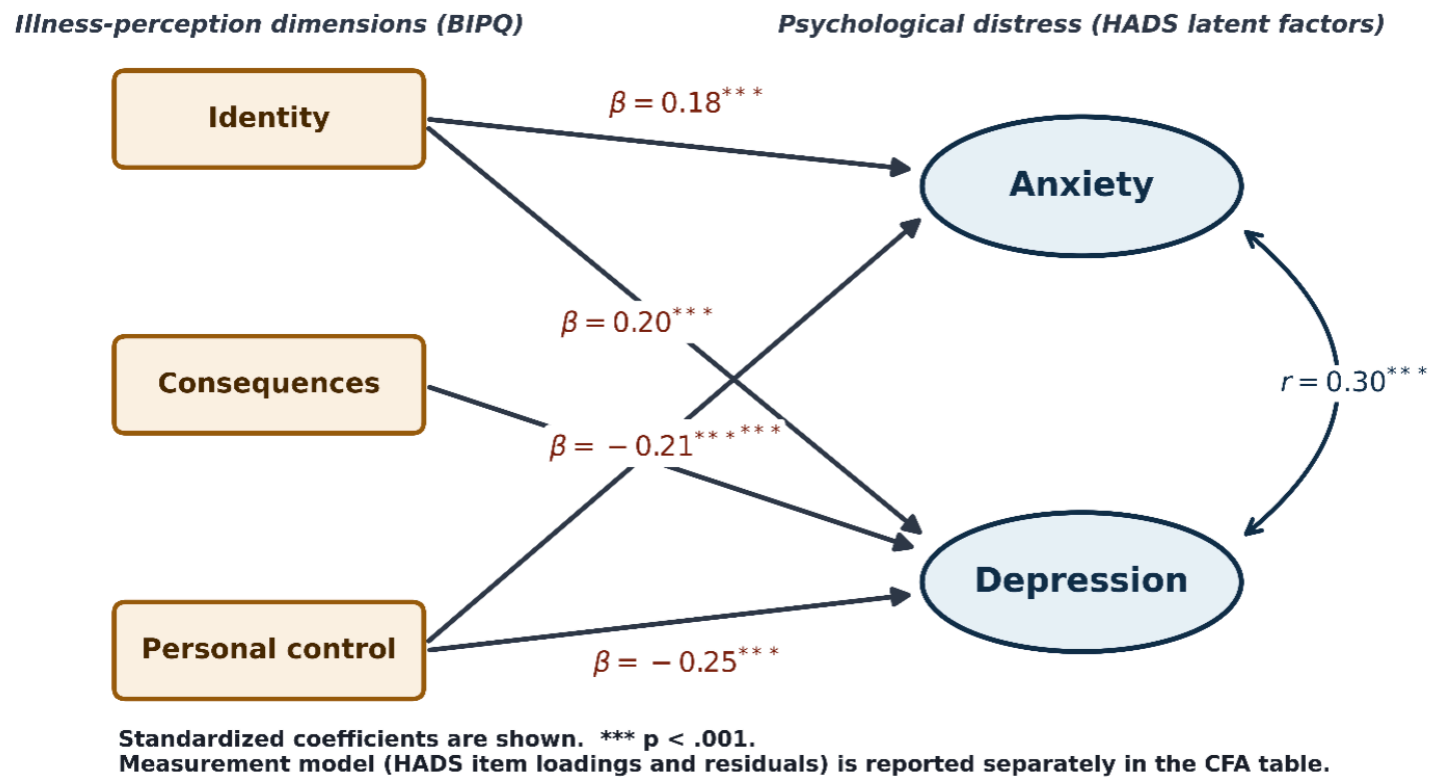


Figure 1

The final path diagram