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Development of a Structural Model of Quality of Life for Cardiac Patients Based on Health Locus of Control and Illness Perception with the Mediating Role of Alexithymia

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A B S T R A C T

Objective: This study aimed to develop a structural model of the quality of life for cardiac patients based on health locus of control and illness perception with the mediating role of alexithymia in the cardiac patient population visiting hospitals in Tehran.

Methods and Materials: The research method was correlational. A total of 281 patients were selected through purposive sampling and responded to the Minnesota Living with Heart Failure Questionnaire, the Illness Perception Questionnaire, the Multidimensional Health Locus of Control Scale, and the Toronto Alexithymia Scale. Data analysis was conducted using structural equation modeling.

Findings: The results indicated that the structural model of quality of life for cardiac patients based on health locus of control and illness perception, mediated by alexithymia, was a good fit. Additionally, there was a significant positive relationship between health locus of control and illness perception with quality of life ($p < 0.05$), a significant negative relationship between alexithymia and quality of life ($p < 0.05$), and a significant negative relationship between health locus of control and illness perception with quality of life ($p < 0.05$).

Conclusion: Attention to health locus of control and providing training to strengthen internal locus of control, designing psychological interventions based on illness perception, and training in emotional expression and management for psychosomatic patients like those with cardiac conditions are recommended.

Keywords: *Quality of life in cardiac patients, health locus of control, illness perception, alexithymia.*

1. Introduction

In most chronic diseases, including cardiac conditions, the concept of quality of life plays a crucial role in coping with the disease. There is substantial evidence that individuals with heart failure struggle with numerous physical and psychological consequences. The collection of physical and psychological symptoms reduces daily activities and the ability to perform work and social activities for cardiac patients, all of which indicate a lower quality of

life in these patients (Bahadur et al., 2017; Rejeh et al., 2015). It appears that one of the factors in psychosocial adaptation to chronic diseases is the health locus of control. Naidu (2000) believes that individuals with an internal locus of control have strong beliefs in making health-related behavioral decisions and consider themselves responsible for their own health. Conversely, those with an external locus of control generally act passively, do not hold themselves directly responsible for their health, and always believe in the influence of fate, chance, doctors, and the powerful force of others in relation to their disease or health (Fathabadi et al., 2018). Locus of control is considered a significant characteristic related to health because it influences whether an individual believes the environment is under their control or they are under environmental control (Neymotin & Nemzer, 2014). There is a close relationship between the health locus of control, health behaviors, and patients' sense of control and responsibility in the care and treatment process (Fathabadi et al., 2018). Additionally, there is a relationship between the quality of life and health locus of control (Alipour Hamze Kandi & Zeinali, 2017; Ghasemzad et al., 2010; Helvik et al., 2016; Rizza et al., 2017). The greater an individual's external health control, the more their health improves, and they feel important to others, resulting in a happier and higher quality life (Neymotin & Nemzer, 2014; Rizza et al., 2017).

One of the variables that influence the enhancement of self-efficacy skills in chronic diseases, especially cardiac diseases, is the understanding of the disease and coping with it. A patient's perception of their illness plays a decisive role in the type of health behaviors of patients with coronary artery disease and their recovery (Mohajerani et al., 2017). According to Leventhal's theory (1998), patients adjust their behavior and emotional response to the disease based on their perceptions of its nature, causes, consequences, controllability, treatability, and duration (Barghi Irani et al., 2014). Findings indicate a significant role of illness perception in determining outcomes and adaptation to diseases like heart attacks (Byrne et al., 2005). Spatola et al. (2014), found that knowledge and understanding of the disease have predictive value in enhancing health behaviors in patients with heart disease (Spatola et al., 2014). Illness perception is also a predictor of quality of life (Aghayousefi et al., 2012; Mohajerani et al., 2017; Parsamehr et al., 2015; Spain et al., 2007). The results of research by Ysrraelit et al. (2018) also showed that the physicians' estimates of the quality of life of individuals with MS differ significantly from the patients' estimates due to their different perceptions of the disease (Ysrraelit et al., 2018).

Often, individuals with chronic diseases like heart disease struggle with expressing their emotions and feelings due to alexithymia. Roger and Jameson (1998) also confirmed emotional expression styles in various health dimensions and found a relationship between emotional expression styles and coronary artery disease (Mahdavi & Manshaee, 2016). Alexithymia is associated with several physical problems such as primary hypertension, inflammatory bladder disease, pain dimensions, heart distress, and types of diabetes (Dubey et al., 2010; Grabe et al., 2010). Research has also shown that there is a relationship between alexithymia and quality of life in patients with fibromyalgia (Tesio et al., 2018), inflammatory bowel diseases (Iglesias-Rey et al., 2012), and coronary heart patients (Mohamadpoor et al., 2015).

Given the theoretical foundations and previous research, it seems that the presented model is based on a biopsychosocial-emotional pattern that enables cognitive-emotional self-regulation of knowledge and perception regarding the disease, along with the theoretical foundations of social learning, motivation, and individual beliefs in controlling health outcomes. These two factors, namely cognition and controllability of the disease, can affect cognitive-emotional processes such that the patient has healthier emotional processing and consequently increases the quality of their health-related life. However, it seems that most research conducted both in Iran and globally has emphasized the variables of illness perception, health locus of control, and alexithymia separately and less attention has been paid to examining their relationships with each other, and no model has been fitted in this regard. Furthermore, research on predicting the quality of life in cardiac patients based on illness perception and alexithymia is limited only to the research by Parsamehr et al. (2014) and Mohammadpour et al. (2015) (Mohamadpoor et al., 2015; Parsamehr et al., 2015). Therefore, the research conducted is either very limited or no new research has been conducted. While lifestyle and health-related quality of life, which are affected by lifestyle, have changed over time with the complexities of the environment and are accompanied by challenges. This requires further investigation around the predictors of quality of life in cardiac patients, whose prevalence is increasing. Therefore, in the current research model, it is assumed that there is a direct relationship between health locus of control and illness perception with the quality of life, and these two variables have both a direct

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and an indirect impact on the quality of life of cardiac patients through alexithymia. Given the sensitivity of the topic for researchers, health planners, and therapists, the researcher seeks to answer the main research question of whether alexithymia plays a mediating role in the relationship between health locus of control and illness perception with the quality of life of cardiac patients.

2. Methods and Materials

2.1. Study Design and Participants

This research is correlational in method. The statistical population of this study included all married cardiac patients over the age of 30 who visited the Tehran Heart Center, Shahid Rajaei Heart Hospital, and Khatam Al-Anbia Hospital in Tehran for outpatient examinations in 2018 and 2019 and had been diagnosed with heart disease for at least one year. Married individuals were selected because the stress factors in life that potentially lead to heart disease differ between single and married people and naturally affect the quality of life of these patients. Moreover, since age plays a significant role in the incidence of heart diseases and the likelihood increases with age, patients over 30 years were considered in this research. To conduct the research, necessary coordination was made with the heads of departments and emergency units of the mentioned hospitals. Cardiac patients who were over 30 years old, married, and had been diagnosed with heart disease for over a year, visiting these centers for routine cardiac examinations, were selected using purposive sampling (n=281). After the researcher explained the study design, those patients who consented to participate received the Minnesota Living with Heart Failure Questionnaire, the Brief Illness Perception Questionnaire, the Multidimensional Health Locus of Control Scale, and the Toronto Alexithymia Scale. To accommodate cardiac patients, questionnaires with a minimal number of questions were used. Participants who were able to respond on-site completed the questionnaires. Those who were unable to respond at the time due to time constraints or physical conditions completed the questionnaires at home after receiving instructions on how to complete them, and sent scanned images of the questionnaires via available messaging services to the researcher. Finally, after discarding incomplete questionnaires, data from 281 questionnaires were analyzed. Additionally, the researcher provided his contact number at the top of the questionnaires in case the participants encountered any ambiguities while filling them out.

2.2. Measures

2.2.1. Quality of Life

This questionnaire was developed by Rector, Francis, and Cohn in 1987 to assess the condition of cardiac patients and their treatment among American patients and is the most significant and commonly used tool for assessing the quality of life of heart failure patients, translated into 32 languages. It consists of 21 questions that evaluate physical, psychological, and socio-economic limitations caused by heart failure symptoms over the past month. Questions are rated on a six-point Likert scale from 0 to 6, where 0 indicates the best condition and 5 the worst; thus, the minimum score obtained from this questionnaire is zero and the maximum is 105. Higher scores indicate poorer quality of life. Researchers demonstrated that this tool is valid and reliable for assessing the quality of life of cardiac patients across different cultures. This questionnaire is highly reliable and has consistently achieved a Cronbach's alpha of about 0.9 in all related studies (Bennett et al., 2002; Gorkin et al., 1993). The English version of this questionnaire was translated back into Persian. The validity of the Persian version of the Minnesota questionnaire was established through content validity in research by Sadeghi, Alavizarnag, Ahmadi, et al. (2009). Reliability was achieved in the research by Abbasi et al. (2016) using the Cronbach's alpha coefficient of 0.96 (Abbasi et al., 2016; Sadeghi Sherme et al., 2009).

2.2.2. Health Locus of Control

This scale was developed by Wallston, Stradler Wallston, and DeVellis (1978) and was revised by Wallston (2005). It consists of 18 items with three subscales: internal health locus of control, external health locus of control (others), and external health locus of control (chance). Each subscale includes 6 items measured on a six-point Likert scale from strongly disagree (score 1) to strongly agree (score 6). Thus, individual scores range from 6 to 36 for each subscale and are assessed separately. In research by Mani et al. (2018), acceptable reliability was obtained with a Cronbach's alpha of 0.85 and subscale coefficients ranging from 0.63 to 0.79. Regarding concurrent validity, the scale showed acceptable correlation with the internal-external locus of control scale by Rotter (Mani A et al., 2019).

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2.2.3. *Illness Perception*

This 9-item questionnaire was designed by Broadbent, Petrie, Main, et al. in 2006 to assess the emotional and cognitive representation of illness. It measures consequences, duration, personal control, nature, control over treatment, concerns, understanding of illness, and emotional response. The scoring range for the first eight questions is from 1 to 10. Broadbent and colleagues (2006) reported concurrent validity of this scale with the revised Illness Perception Questionnaire in a sample of patients with asthma, diabetes, and kidney disease, indicating correlations of subscales from 0.32 to 0.63. They also found correlations of subscale scores with specific self-efficacy of asthma patients from 0.47 to 0.53. This questionnaire was first translated into Persian by Arjmand, Ghasemzadeh, Hamidpour, et al. (2010) and was used to assess illness perception in patients with breast cancer. In research by Kalantari, Bagherian Sararoudi, Afshar, et al. (2012), the Cronbach's alpha for this questionnaire was 0.80, and the retest reliability coefficient over six weeks for various questions ranged from 0.42 to 0.75 (Kalantari et al., 2012).

2.2.4. *Alexithymia*

The Toronto Alexithymia Scale was developed by Bagby, Parker, and Taylor (1994). It is a self-report instrument consisting of 20 questions covering three dimensions: difficulty identifying feelings, difficulty describing feelings, and externally-oriented thinking. Questions are scored on a five-point Likert scale, where completely disagree=1, disagree=2, neutral=3, agree=4, and completely agree=5. Scoring for statements 4, 5, 10, 18, and 19 is reversed. Scores above 60 are considered high alexithymia, scores between 53-60 as moderate alexithymia, and scores below 52 as low alexithymia (no alexithymia). In research by Bagby et al. (1994), the scale exhibited good internal consistency and retest reliability, reflecting a three-factor structure consistent with the theoretical construct of alexithymia. Cronbach's alpha coefficients in the study by Bagby et al. (1994) were 0.81 for the overall scale and 0.78, 0.75, and 0.66 for the subscales of difficulty identifying feelings, difficulty describing feelings, and externally-oriented thinking, respectively. Internal consistency reliability in Iranian samples for the overall scale and subscales of identifying feelings, difficulty describing feelings, and externally-oriented thinking in a clinical Iranian sample using retest method were reported as 0.77, 0.73, 0.69, and 0.65 respectively (Besharat, 2012). Retest reliability of the scale in a sample of 67 individuals across two sessions four weeks apart confirmed from 0.70 to 0.77 for overall alexithymia and various subscales. Concurrent validity of the Toronto Alexithymia Scale was evaluated and confirmed based on correlations between the subscales of this test and scales of emotional intelligence, psychological well-being, and psychological distress. Pearson correlation coefficients showed that there were significant correlations between participants' scores on the overall Toronto Alexithymia Scale and emotional intelligence, psychological well-being, and psychological distress. Correlations between alexithymia subscales and the aforementioned variables were also significant (Zakeri et al., 2017).

2.3. *Data analysis*

Data analysis was performed using structural equation modeling. Version 26 of the SPSS software and version 24 of the AMOS statistical software were used.

3. Findings and Results

Descriptive findings related to 281 participants in the study showed that 206 individuals (equivalent to 73.3%) were male. The highest frequency was in the age range of over 60 years with 144 individuals (51.24%), and the lowest frequency was in the age range of 30-40 years with 29 individuals (10.32%). The highest frequency of educational attainment was a bachelor's degree, including 99 individuals (35.23%), and the lowest was a high school diploma, including 18 individuals (6.40%). The highest frequency of disease duration was 3 to 4 years, including 122 individuals (43.42%), and the lowest was 1 to 2 years, including 40 individuals (14.23%).

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Table 1

Descriptive Characteristics of Research Variables

Variable	Mean	SD	Variance	Skewness	Kurtosis
Health Locus of Control	3.614	0.559	0.313	-0.222	-0.114
Internal Health Locus of Control	3.655	0.623	0.388	-0.493	0.098
External Health Locus of Control (Others)	3.510	0.628	0.394	-0.161	-0.176
External Health Locus of Control (Chance)	3.677	0.698	0.487	-0.301	-0.286
Illness Perception	3.623	0.642	0.412	-0.313	-0.231
Alexithymia	3.457	0.581	0.338	-0.171	-0.071
Difficulty Identifying Feelings	3.831	0.571	0.327	-0.642	-0.726
Difficulty Describing Feelings	3.242	0.721	0.520	-0.040	-0.094
Externally-Oriented Thinking	3.265	0.727	0.528	-0.085	-0.612
Quality of Life of Cardiac Patients	3.490	0.511	0.262	-0.197	-0.076
Physical Limitations	3.568	0.583	0.340	0.280	0.407
Psychological Limitations	3.221	0.736	0.542	-0.011	-0.411
Socio-economic Limitations	3.581	0.521	0.271	-0.386	-0.116

As seen in Table 1, for the Health Locus of Control variable, the highest mean relates to External Health Locus of Control (Chance) (3.677) and the lowest to External Health Locus of Control (Others) (3.510); in the Alexithymia variable, the highest mean is for Difficulty Identifying Feelings (3.831) and the lowest for Difficulty Describing Feelings (3.242); in the Quality of Life of Cardiac Patients variable, the highest mean is for Socio-economic Limitations (3.581) and the lowest for Psychological Limitations (3.221).

Table 2

Pearson Correlation Coefficients Among Study Variables

Variable	1	2	3	4	5	6	7
1. Internal Health Locus of Control	1						
2. External Health Locus of Control (Others)	.345*	1					
3. External Health Locus of Control (Chance)	.411*	.412*	1				
4. Health Locus of Control	.310*	.450*	.318*	1			
5. Illness Perception	.345*	.333*	.355*	.340*	1		
6. Alexithymia	-.419*	-.378*	-.316*	-.407*	-.347*	1	
7. Quality of Life of Cardiac Patients	-.415*	-.444*	-.410*	-.367*	-.380*	-.352*	1

*p<0.01

Pearson correlation results showed a significant negative relationship between Health Locus of Control and Alexithymia (r = -.407; p = .01), a significant positive relationship between Health Locus of Control and Quality of Life of Cardiac Patients (r = .367; p = .01), a significant negative relationship between Illness Perception and Alexithymia (r = -.347; p = .01), and a significant positive relationship between Illness Perception and Quality of Life of Cardiac Patients (r = .387; p = .01), and a significant negative relationship between Alexithymia and Quality of Life of Cardiac Patients (r = -.352; p = .01).

Before conducting path analysis, assumptions of multivariate normality, linearity, multicollinearity, and error independence were tested and confirmed. Skewness and kurtosis tests were used to check the normality of data. Since the skewness and kurtosis statistics for the research variables were all between -2 and +2, the assumption of data normality is confirmed. To check for multicollinearity, the tolerance statistic and variance inflation factor were used, and for all variables, the variance inflation factor was less than 10, and the tolerance statistic was more than 0.01; thus, the assumption of no multicollinearity was maintained. The Durbin-Watson test was used to test the assumption of error independence. The obtained value in this research was 2.18, and since it is within the range of 1.5 to 2.5, it indicates the assumption of error independence is met. With these assumptions met, the fit of the proposed model can be assessed based on fit criteria. Path analysis using SPSS and Amos software was used to evaluate the proposed model.

Model fit results indicated that the $\chi 2$ statistic was 293.45 with 101 degrees of freedom. The chi-square to degrees of freedom ratio was 2.90, which is less than 3, indicating

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excellent model fit. The Goodness of Fit Index (GFI) was 0.914, suggesting a satisfactory model fit. The Adjusted Goodness of Fit Index (AGFI) was 0.870, which is greater than 0.85, thereby confirming a satisfactory fit of the model. The Root Mean Square Error of Approximation (RMSEA) was also 0.070, which is considered good as it is less than 0.1, further confirming the validity of the research model. The Normed Fit Index (NFI) was 0.988, the Tucker-Lewis Index (TLI) was 0.962, the Comparative Fit Index (CFI) was 0.911, and the Relative Fit Index (RFI) was 0.931, all of which indicate a satisfactory fit and confirm the research model.

Given the above data and the quantitative fit indices, it can be concluded that the theoretical model of the research is acceptable. Therefore, the relationships within the model and the regression coefficients between the latent variables can be examined. For hypothesis testing, the p-value index is used. A relationship is considered significant if the p-value for the relationship in question is less than 0.05. Therefore, the main hypothesis of the research, stating that "the model based on the relationship between the quality of life of cardiac patients based on health locus of control and illness perception with the mediating role of alexithymia is adequately fit," is confirmed.

The proposed model for developing a structural model of quality of life for cardiac patients based on Health Locus of Control and Illness Perception with the mediating role of Alexithymia is shown in Figure 1.

Figure 1

Model with Beta Coefficients

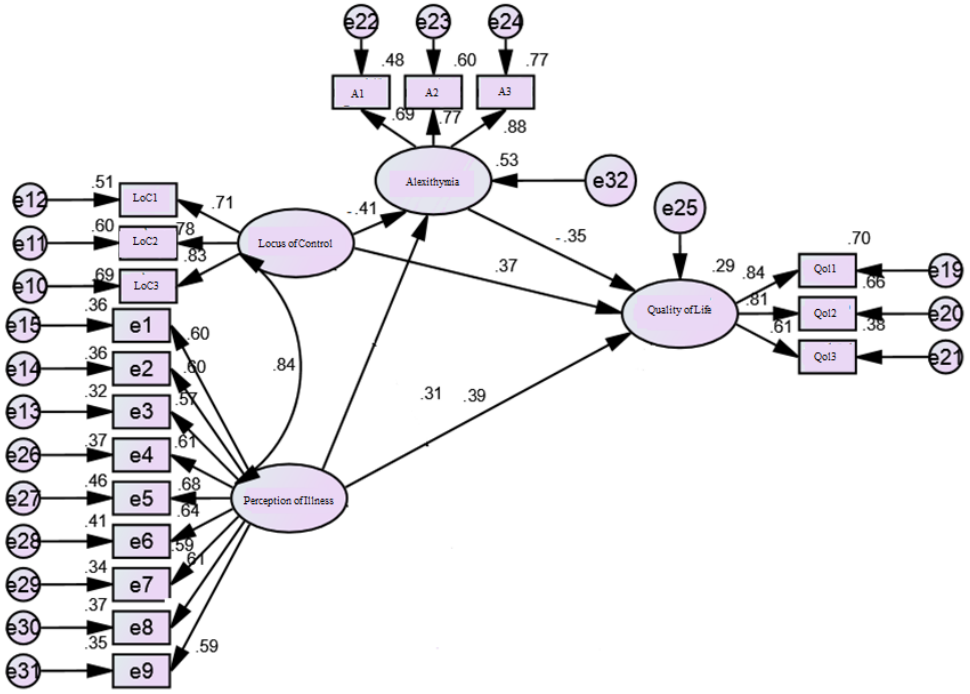

Table 3

Estimates of Indirect Paths in the Model Using Bootstrap

Path	Estimate	Upper Bound	Lower Bound	Significance Level	Confidence Interval
Health Locus of Control	-0.541	-0.211	-0.322	0.0005	95%
Illness Perception	-0.611	-0.141	-0.388	0.0005	95%

Based on Figure 1 and the data in Table 3, the effect of the Health Locus of Control, mediated by alexithymia on the quality of life of cardiac patients, is estimated with an indirect effect coefficient of -0.541, significant at the 95% confidence level; as the bootstrap results for the indirect effect demonstrated that the lower and upper bounds of this

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path coefficient do not include zero: (-0.322 to -0.211) CI 95% -0.541 Thus, the mediating role of alexithymia in the research hypothesis is confirmed.

Similarly, the effect of Illness Perception, mediated by alexithymia on the quality of life of cardiac patients, is estimated with an indirect effect coefficient of -0.611, significant at the 95% confidence level; as the bootstrap results for the indirect effect demonstrated that the lower and upper bounds of this path coefficient do not include zero: (-0.388 to -0.141) CI 95% -0.611

Therefore, the mediating role of alexithymia in the research hypothesis is confirmed. In other words, the structural model of the quality of life of cardiac patients based on Health Locus of Control and Illness Perception with the mediating role of alexithymia is validated.

In Table 4, direct effect coefficients and significance levels between the research variables are presented.

Table 4

Estimates of Direct Effects of Independent Variables on Dependent Variables

Path	Unstandardized Estimate	Standard Error	t	P	Standardized Coefficient	Result
Health Locus of Control → Alexithymia	-0.278	0.067	-4.124	<0.001	-0.407	Confirmed
Illness Perception → Alexithymia	-0.235	0.062	-3.809	0.002	-0.347	Confirmed
Health Locus of Control → Quality of Life	0.056	0.012	4.688	<0.001	0.367	Confirmed
Illness Perception → Quality of Life	0.072	0.006	12.985	0.002	0.387	Confirmed
Alexithymia → Quality of Life	-1.296	0.322	-4.023	<0.001	-0.352	Confirmed

Based on Figure 1 and Table 4, the strength of the relationship between Health Locus of Control with alexithymia, and the quality of life of cardiac patients is calculated to be -0.407 and 0.367 respectively, indicating a satisfactory correlation. The t-test statistics also obtained were -4.124 and 4.688 respectively, greater than the critical t-value at the 0.05 error level of 1.96, indicating that the observed correlation is significant. Therefore, it can be stated that Health Locus of Control influences alexithymia and the quality of life of cardiac patients, or in other words, there is a significant reciprocal relationship between Health Locus of Control with alexithymia and the quality of life of cardiac patients.

4. Discussion and Conclusion

The present study was conducted with the objective of determining the fit of a structural model of quality of life for cardiac patients based on health locus of control and illness perception with the mediating role of alexithymia. The findings confirmed the research hypothesis and demonstrated that the structural model fits well. To elucidate this finding, the reciprocal relationships among the model's variables are examined.

Regarding the relationship between health locus of control and quality of life, the findings indicated a correlation coefficient of 0.367, suggesting a satisfactory correlation. This finding is consistent with the prior research (Alipour Hamze Kandi & Zeinali, 2017; Ghasemzad et al., 2010; Helvik et al., 2016; Rizza et al., 2017), which demonstrated a relationship between health locus of control and the quality of life of the elderly and individuals with depression. To explain this, it can be said that individuals with an internal health locus of control are more likely to believe that reinforcements are contingent upon their own efforts, whereas those with an external health locus of control may perceive that their lives are largely controlled by external forces such as fate or other powerful people. Individuals who believe they have little control over their health tend to have poorer health habits and more illnesses compared to those who feel a stronger sense of control and are less likely to take active steps toward managing their illness. Patients with an internal locus of control are more likely to engage in preventive behavior changes, are more motivated to obtain information about their illness, and consequently improve their quality of life. Additionally, individuals with a stronger internal locus of control exhibit more health-promoting behaviors, seek to increase their awareness of health determinants, empower themselves, and foster positive beliefs about adapting to their illness, which in turn enhances their quality of life. This finding aligns with the previous study (Alipour Hamze Kandi & Zeinali, 2017; Ghasemzad et al., 2010; Rizza et al., 2017).

Regarding the relationship between illness perception and quality of life, the findings showed a correlation coefficient of 0.387, indicating a satisfactory correlation. This finding is consistent with the prior research (Aghayousefi et al., 2012; Barghi Irani et al., 2014; Parsamehr et al., 2015; Spain et al., 2007; Zahraie et al., 2018). According to Leventhal's self-

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regulation model (1998), beliefs about illness directly relate to an individual's coping and behavior, and the outcome of this adaptation in turn impacts the patient's perception of disability and quality of life. This model suggests that the impact of a problem is moderated by individual beliefs, which play a mediating role. Effective assessment involves understanding one's ability to display adaptive behaviors and estimating one's success in managing disease symptoms and subsequently seeking emotional well-being, that is, when individuals face health threats, they develop cognitive or emotional representations about their illness to understand and evolve strategies for managing the disease. This perception of illness is crucial in directing adaptive methods and specific behaviors related to the disease, such as adherence to treatment. The research by Spain et al. (2007) also demonstrated that an individual with a positive perception of their illness can realistically and accurately understand and analyze various dimensions of the illness, and this perception can influence health-related behaviors (Spain et al., 2007).

Regarding the relationship between alexithymia and quality of life, the findings indicated a correlation coefficient of -0.352, showing a satisfactory correlation. This finding is consistent with the prior research (Mohajerani et al., 2017; Tesio et al., 2018), which showed a significant relationship between alexithymia and the quality of life of patients with ulcerative colitis, migraine, coronary artery diseases, and fibromyalgia. In explaining this finding, it can be said that individuals with alexithymia experience various emotions but cannot recognize and therefore cannot express their emotions and feelings. It appears that individuals who struggle to identify their feelings are more prone to misinterpreting their physical symptoms; mistaking physical symptoms associated with emotional arousal as signs of a physical illness. Moreover, they tend to estimate their health status as poorer compared to those without this trait. Since alexithymia reflects a deficit in the cognitive processing of emotions, it can lead to the onset of psychological and physical symptoms, thereby reducing the health-related quality of life in cardiac patients. Additionally, it is believed that an inability to regulate emotions in cardiac patients predisposes them to more physical symptoms and psychological syndromes associated with a decline in quality of life. In this context, the research by Iglesias-Rey et al. (2012) under the title "The Impact of Alexithymia on Health-Related Quality of Life in Inflammatory Bowel Diseases" showed that alexithymia significantly correlates with poor quality of life in these patients. Difficulty in identifying feelings and objective thinking were the most significant alexithymia subscales related to the health-related quality of life in these patients (Iglesias-Rey et al., 2012).

Regarding the relationship between health locus of control and alexithymia, the findings showed a correlation coefficient of -0.407, indicating a satisfactory correlation. No corresponding research was found to contrast this finding, and it is solely explained. Individuals with an internal locus of control exhibit higher mental health and better quality of life. Since individuals with higher quality of life score lower on alexithymia (Mohajerani et al., 2017; Tesio et al., 2018), it can be said that there is a negative relationship between internal health locus of control and alexithymia. Heart diseases are often a result of unhealthy lifestyle habits, and this inefficient style also encompasses the psychological aspects of the patient, as Avicenna stated that psychological reactions are related to cardiovascular reactions (Mahdavi & Manshaee, 2016). Given the cognitive and emotional deficits in alexithymia, it is hypothesized that this trait could be related to health indicators and physical problems. Since cognitive processes play a significant role in emotional processes, it can be said that an individual's belief in an external locus of control reduces their self-efficacy in terms of disease controllability and emotional affairs; such that the individual is unable to recognize and identify emotions, express and describe emotions, and focus on external experiences. Since locus of control and alexithymia are both personality traits and thus are formed over the course of an individual's lifetime through an inefficient lifestyle, the coexistence of these two factors can continuously be observed.

Regarding the relationship between illness perception and alexithymia, the findings showed a correlation coefficient of -0.347, indicating a satisfactory correlation. In explaining this finding, according to Leventhal's self-regulation model (1998), an individual's perception of illness, besides the cognitive component, which is the perception and evaluation of the current health status, also includes an emotional component. Thus, a high score in illness perception means that after a cognitive assessment of the illness, the individual has given an emotionally appropriate and adaptive response to the stress-inducing conditions of their illness. The outcome of this adaptive response is effective coping behaviors and makes disease controllability possible. On the other hand, an adaptive coping response leads to improved quality of life; in this regard, research has also shown that individuals with higher quality of life score lower on alexithymia (Mohajerani et al., 2017; Tesio et al., 2018).

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Therefore, it can be said that there is a negative relationship between illness perception and belief in its controllability with alexithymia. Heart diseases are often a result of an unhealthy lifestyle, and this inefficient style also encompasses the psychological aspects of the patient. Given the cognitive and emotional deficits in alexithymia, it is hypothesized that this trait could be related to health indicators and physical problems. Since cognitive processes play a significant role in emotional processes, it can be said that illness perception and belief in disease controllability also play a role in emotional affairs; such that an individual with a low score in illness perception has high emotional alexithymia and is unable to recognize and identify emotions, express and describe emotions, and focus on external experiences.

5. Limitations & Suggestions

The limited scope of the statistical population of this research to cardiac patients visiting treatment centers in Tehran confronts the results of this study with limitations. Therefore, to generalize the results, it is recommended that similar research be conducted in a different statistical population.

Since locus of control and alexithymia are both personality traits and thus are formed over the course of an individual's lifetime through an inefficient lifestyle, and heart diseases are also usually caused by an unhealthy lifestyle, it is suggested that future research examine the role of locus of control and alexithymia in the incidence of heart diseases. To improve the quality of life in heart diseases, attention to health locus of control and the provision of training aimed at strengthening the internal locus of control are recommended. Additionally, designing psychological interventions based on illness perception, teaching emotional expression, and emotion management for psychosomatic patients such as those with heart diseases are suggested.

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Declaration

In order to correct and improve the academic writing of our paper, we have used the language model ChatGPT.

Declaration of Interest

The authors of this article declared no conflict of interest.

Ethics 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 contributed equally.

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