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Structural Model of Personality Traits and Illness Perception with Functional Disability in Functional Somatic Syndromes in Patients with Coronary Artery Disease Based on the Mediating Role of Self-Care Behavior

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A B S T R A C T

Objective: Heart diseases, including coronary artery disease, are among the three main causes of death alongside cancer and stroke in most countries. The current study aimed to predict functional disability in functional somatic syndromes in patients with coronary artery disease based on personality traits and illness perception, considering the mediating role of self-care behavior.

Methods and Materials: This study, with applied objectives and a correlational research design, was conducted using the structural equation modeling approach. The statistical population included all patients with coronary artery disease in the city of Amol in the year 2022, from which 250 individuals were purposefully selected. Data collection tools included the World Health Organization Disability Assessment Schedule (2014), the McCrae and Costa Personality Traits Questionnaire (1985), the Illness Perception Questionnaire (2006), and the Self-Care Questionnaire (2003). The statistical technique used was structural equation modeling with full latent variables. SPSS version 26, AMOS version 24, and R version 4.2.0 software were used for statistical data analysis.

Findings: The results showed that all five personality dimensions, illness perception, and self-care significantly explain the variance in functional disability ($P<0.01$). Additionally, the mediating role of self-care behavior was significant in the relationship between functional disability and four personality dimensions: extraversion, openness to experience, agreeableness, conscientiousness, and illness perception ($P<0.01$).

Conclusion: It can be concluded that functional disability in functional somatic syndromes in patients with coronary artery disease can be predicted based on their personality traits and illness perception, taking into account the mediating role of self-care behavior.

Keywords: *Personality traits, Illness perception, Functional somatic syndrome, Coronary artery, Self-care behavior.*

1. Introduction

Heart diseases, including coronary artery disease, rank among the three principal causes of mortality alongside cancer and stroke in most countries (Pascual-Madorran et al., 2021). In recent years, infectious diseases have given way to cardiovascular diseases and cancer. Coronary artery disease, part of cardiovascular diseases, arises from the narrowing or blockage of coronary arteries (Fadaei et al., 2020). In most developed countries, coronary artery disease (CAD), primarily caused by atherosclerosis of the coronary arteries, is a leading cause of death (Shao et al., 2020). Nearly one-third of deaths worldwide are due to heart diseases, especially coronary artery disease (Akhtar et al., 2022).

Coronary artery disease is a common ailment in today's world, significantly impacting individual and societal lives. This disease involves processes such as lipid disorders, thrombosis, inflammation, activation of vascular smooth cells, remodeling, platelet activation, endothelial dysfunction, oxidative stress, and altered matrix metabolism (Shao et al., 2020). Coronary artery disease is exacerbated by two groups of risk factors: behavioral risk factors (such as physical inactivity and tobacco use) and metabolic risk factors (such as high blood sugar and cholesterol levels) (Pascual-Madorran et al., 2021). The prevalence of coronary artery disease is associated with age, gender, economic status, and other factors (Malakar et al., 2019). Individuals with coronary artery disease face various problems and the risk of recurrent disease due to its chronic and progressive nature (Ghasemzadeh Kuchi et al., 2023).

Patients with coronary artery disease exhibit levels of functional disability affecting their social, educational, physical, and psychological operations (Dahm et al., 2015). Functional disability means having functional problems at the physical, personal, and social levels in one's life. The World Health Organization defines functional disability as any long-term limitation in everyday activities due to health problems and conditions. Functional disabilities occur at the level of functional somatic syndromes. Somatic symptoms of coronary artery disease are evident, yet generally, about half of the physical complaints in medical illness are unexplained and lack a specific cause (Eydi et al., 2020). These symptoms, identified as functional somatic syndromes, arise when the cause is not entirely determined and are considered physical symptoms lacking medical explanation (Malakar et al., 2019; Shao et al., 2020). These syndromes include symptoms like persistent fatigue, irritable bowel syndrome, persistent pelvic pain, and rapid and deep breathing signs (Edwards et al., 2019).

In assessing functional disability or ability in patients, individual characteristics and personality traits play a crucial role, with factors like conscientiousness or commitment significantly influencing their condition (Ruocco et al., 2014). Personality traits can be defined as specific and distinct patterns of thought, emotion, and behavior that shape an individual's personal style in interacting with their social and material environment (Babakhouya, 2019). Personality traits are general mechanisms of adaptation and compatibility that develop and evolve in individuals over time and across different environments as mental solutions to sustain life and maintain relations (Bahrudin & Amir, 2019).

In line with the personality traits of patients, what is important for achieving better and more self-care is the understanding of their condition or perception of illness (Babakhouya, 2019; Fadaei et al., 2020). Illness perception refers to the patient's organized cognitive representation of their illness (Najafi Ghezeljeh et al., 2019). A patient's understanding of their illness and condition can affect their physical, psychological health, and ability to cope with the disease (Parsamehr et al., 2015). Illness perception in patients is formed based on gathering information from various sources and patient beliefs, impacting their mental health and ability to adapt to the illness (Broadbent et al., 2006; Eydi et al., 2020). Patients' recognition of their illness under the term illness perception or cognitive representation of illness by the patient is based on information absorption from different sources and patient beliefs (Bagharian et al., 2018; Bagherian-Sararoudi et al., 2020). This factor can affect physical, psychological health, and the individual's ability to cope with the disease. This perception of illness plays a crucial role in guiding specific behaviors and responses related to the disease, such as adherence to treatment (Monirpour et al., 2020). In physical diseases like coronary artery disease, illness perception significantly clarifies disease outcomes and patients with similar symptoms and severity conditions have different perceptions of their illness, affecting self-care behaviors and related actions (Oliveira-Kumakura et al., 2019).

Self-care behavior in patients is considered one of the most essential basic strategies for disease control (Kioskli et al., 2019). Self-care refers to the set of actions that an individual undertakes to maintain physical and mental health, prevent diseases, and take appropriate therapeutic measures for self-improvement (Tabiban et al., 2019; World

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Health, 2022). Self-care behavior not only improves the quality of life but also reduces hospitalization rates, thereby decreasing costs (Amegbor et al., 2018). In fact, self-care behavior in cardiac patients involves the ability and the necessity to regulate and control dietary plans, behaviors, and daily activities from the patient's perspective to maintain proper cardiac and vascular function within natural limits (Eydi et al., 2020). Self-care behavior, considered one of the most important basic strategies for disease control in patients (Kioskli et al., 2019), includes following recommended dietary regimes, engaging in regular physical activity, monitoring blood pressure, and regulated consumption of medications (Diebold et al., 2018). Stress and inadequate self-care may be factors leading to poor cardiovascular function and heart disease outcomes, increasing stress in patients and subsequently leading to other physical, behavioral, and psychological disorders (Amegbor et al., 2018).

This research aims to elucidate the extent to which personality traits and illness perception variables affect the variable of functional disability in functional somatic syndromes in patients with coronary artery disease, considering the mediating role of self-care behavior. This study is conducted in the current context where the incidence of coronary artery disease is increasing, and functional disability in these patients is evident and a significant factor in their societal and daily activity exclusion. Personality traits, illness perception, and self-care are considered three effective pillars in achieving this objective, thus warranting direct attention. Previous research has primarily focused on the direct effectiveness of these variables, often on diseases other than functional disability in functional somatic syndromes of coronary artery disease, and has not specifically addressed functional disability in coronary artery patients, nor has it explained the relationship between these variables through the effectiveness on a third variable. Self-care is a crucial variable in reducing the complications of coronary artery disease. Given that personality traits and illness perception play a significant role in patients' self-care behavior, this research also pays direct and indirect attention to this variable. The issue and research focus of this study are to analyze and explain the fit of the structural model of personality traits and illness perception with functional disability in functional somatic syndromes in patients with coronary artery disease based on the mediating role of self-care behavior.

2. Methods and Materials

2.1. Study Design and Participants

The current study, with its applied objectives, employed a correlational research design using structural equation modeling to simultaneously examine the relationships among predictor, criterion, and mediating variables. Data collection was cross-sectional. The study population included all patients with coronary artery disease in the city of Amol in the year 2022, from which 250 individuals were purposefully selected. In structural equation modeling, Stevens (1996) recommends a ratio of 15 subjects per observed variable, and Mitchell (1993) recommends a ratio of 10 to 20 subjects per observed variable. Therefore, in this study, due to the small number of observed variables, the sample size was calculated to be 20 times the number of observed variables, i.e., 180. However, considering that larger samples are preferable for structural models, 250 individuals were selected as the final sample.

2.2. Measures

2.2.1. Personality Traits

The short form of the personality traits questionnaire was designed by McCrae and Costa (1985) with 60 questions and 5 traits: neuroticism, openness to experience, extraversion, agreeableness, and conscientiousness. Each of the 5 major factors is measured by 12 items. The response sheet is based on a Likert scale (strongly disagree 0, disagree 1, neutral 2, agree 3, and strongly agree 4). Construct and content validity were confirmed by the creators, with a Cronbach's alpha reliability ranging from .79 to .88. In Iran, construct and content validity were validated by Grossi Farshi (2001), reporting a Cronbach's alpha reliability of .56 to .87. In this research, reliability of the instrument using Cronbach's alpha for the five factors was respectively .84, .82, .87, .79, and .83, indicating the data collected were reliably valid (Bahrudin & Amir, 2019; Fadaei et al., 2020).

2.2.2. Illness Perception

Illness Perception Questionnaire by Broadbent et al. (2006): The illness perception questionnaire designed by Broadbent et al. (2006) consists of 9 questions. The range of scores for the first 8 questions is 0 to 80. Question 9, an open-ended question, asks for the three main causes of the illness. Broadbent et al. (2006) validated its construct and content, reporting a Cronbach's alpha reliability for this questionnaire of .86. In Iran, Bazazian et al. (2010) confirmed its content and concurrent validity, with a Cronbach's alpha reliability

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of .80 and a test-retest reliability coefficient over 6 weeks for different questions reported as .75. In this study, the validity of data collected through this instrument, using Cronbach's alpha method, was .88, indicating appropriate data validity (Bazzazian & Besharat, 2010).

2.2.3. *Self-Care*

The self-care questionnaire for heart failure patients was designed by Jarasmas and colleagues in 2003 with 12 questions. Each question's response is based on a 5-point Likert scale from "strongly agree" (score 1) indicating improper self-care behavior to "strongly disagree" (score 5). The total score ranges from 12 to 60, with lower scores indicating better self-care. Scores of 12-28 indicate good self-care, 29-44 indicate moderate self-care, and 45-60 indicate poor self-care. Jarasmas and colleagues (2003) confirmed its construct and content validity and reported a Cronbach's alpha reliability for this questionnaire of .82. In Iran, Mansouri validated the construct and reported a Cronbach's alpha reliability of .71 (Sabourian Jouybari et al., 2015).

2.3. *Data analysis*

The statistical technique used in this research, considering the nature of the study and hypotheses, was structural equation modeling with full latent variables. This model examines the measurement relationships between latent variables and observed variables, as well as the structural relationships among the latent variables. Initially, an analysis was conducted in response to the primary research question regarding the fit of the proposed model with the data, presenting the model fit indices. Subsequently, the research questions were examined. Additionally, the assumptions for using this method were reviewed before conducting the statistical analysis. For statistical data analysis, SPSS version 26, AMOS version 24, and R software (including the 'lavaan' and 'mvnormtest' packages) were used.

3. Findings and Results

A summary of the descriptive results (mean, standard deviation, skewness, and kurtosis) for the participants' scores on the variables of functional disability, personality type, illness perception, and self-care is presented in Table 1.

Table 1

Descriptive Statistics of Research Variables

Dimension	Mean	Standard Deviation	Skewness	Kurtosis
Functional Disability	36.48	8.13	-0.44	-0.09
Personality Type				
Neuroticism	29.50	6.30	-0.24	0.05
Extraversion	34.67	7.98	0.71	0.18
Openness to Experience	35.09	5.86	-0.22	0.08
Agreeableness	30.51	6.79	-0.63	0.00
Conscientiousness	34.84	7.44	0.14	0.05
Illness Perception	44.98	10.91	-0.20	0.12
Self-Care	32.04	6.51	-0.61	-0.02

One of the main assumptions for selecting an appropriate statistical method is the known distribution shape of the data. The choice of structural equation modeling method depends on whether the data are normal or not. To assess the deviation from normality of the research's dependent variables, a multivariate energy test was used. Based on the test statistic and the significance obtained, it can be claimed that this assumption holds (P = .27 and MVE = 1.88), hence there is no impediment to using the structural equation modeling method of covariance-based models. Subsequently, the adequacy of the research model titled "The Structural Model of the Relationship between Personality Traits and Illness Perception with Functional Disability in Functional Somatic Syndromes in Patients with Coronary Artery Disease Based on the Mediating Role of Self-Care Behavior" was examined. The structural model, after data analysis, is presented as the best fitting model with the fit indices mentioned in Table 2.

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Table 2

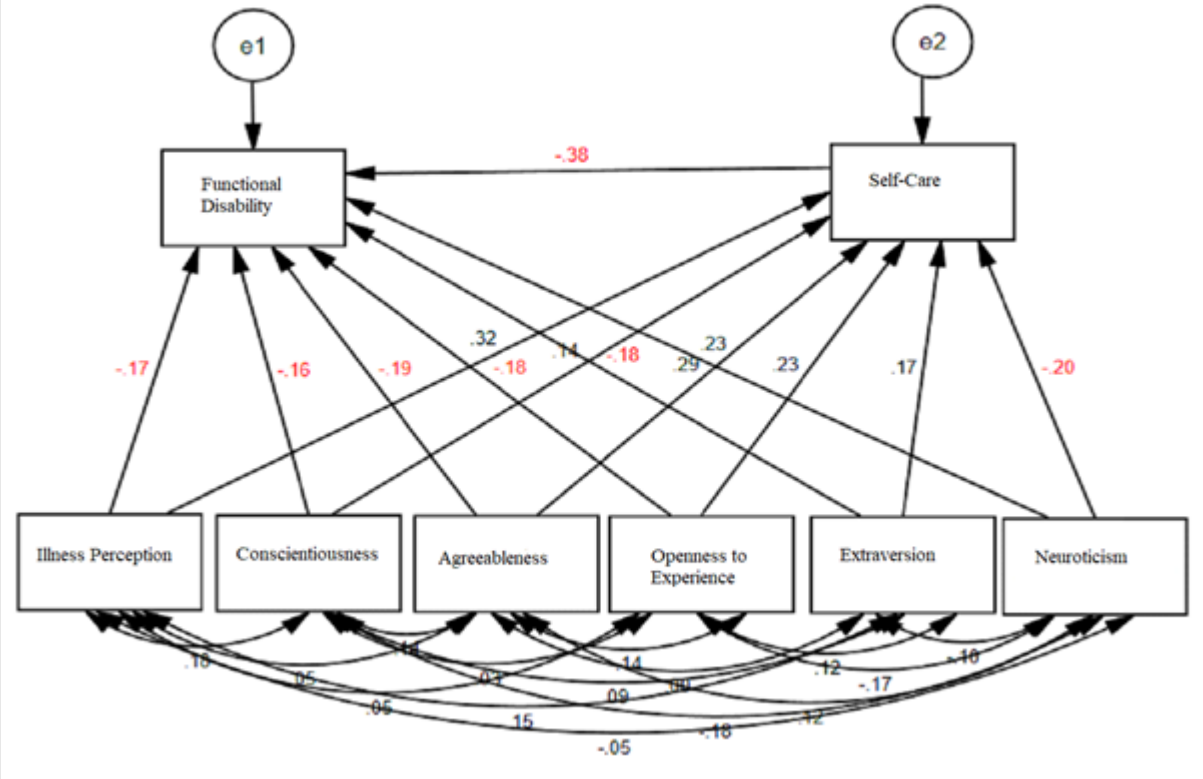
Fit Indices for the Structural Model

Index	Value	Acceptable Threshold
Chi-Square to Degrees of Freedom Ratio	0.98	Less than 3
RMSEA (Root Mean Square Error of Approximation)	0.03	Less than 0.08
CFI (Comparative Fit Index)	0.99	Higher than 0.9
NFI (Normed Fit Index)	0.95	Higher than 0.9
TLI (Tucker-Lewis Index)	0.99	Higher than 0.9
IFI (Incremental Fit Index)	0.98	Higher than 0.9

The obtained values for these indices indicate that the model is in a very suitable condition to explain and fit, and therefore, the examination of the research's subsidiary questions is unobstructed. The standardized model is also presented in Figure 1.

Figure 1

A Summary of the Model with Standard (Beta) Coefficients



Further, using the results obtained in the research model, answers to the research questions have been provided. It is important to note that to understand whether the relationship between variables is significant, the z statistic and significance level or P-Value were used.

Table 3

Coefficients and Significance of Direct and Indirect Effects

Criterion Variable	Predictor Variable	Mediator Variable	Effect	z	p
Self-Care	Neuroticism	-	-0.20	-4.67	0.001
	Extraversion	-	0.17	3.87	0.001
	Openness to Experience	-	0.23	5.24	0.001

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	Agreeableness	-	0.29	6.76	0.001
	Conscientiousness	-	0.14	3.28	0.001
	Illness Perception	-	0.31	7.27	0.001
Functional Disability	Neuroticism	-	0.23	7.38	0.001
	Extraversion	-	-0.17	-5.76	0.001
	Openness to Experience	-	-0.18	-5.86	0.001
	Agreeableness	-	-0.19	-5.98	0.001
	Conscientiousness	-	-0.16	-5.26	0.001
	Illness Perception	-	-0.16	-5.14	0.001
	Self-Care	-	-0.37	-9.31	0.001
	Neuroticism	Self-Care	0.08	4.17	0.001
	Extraversion	Self-Care	-0.06	-3.57	0.001
	Openness to Experience	Self-Care	0.09	4.57	0.001
	Agreeableness	Self-Care	-0.11	-5.47	0.001
	Conscientiousness	Self-Care	0.05	-3.10	0.002
	Illness Perception	Self-Care	-0.11	-5.73	0.001

The results presented in Table 3 indicate, based on the test statistics and obtained significance ($P < .05$ and $Z > 1.96$), that all five dimensions of personality, illness perception, and self-care have a significant direct role in explaining the variance in functional disability. Furthermore, the mediating role of the self-care variable in the relationship between functional disability and the four personality dimensions, namely extraversion, openness to experience, agreeableness, conscientiousness, and illness perception, is significant. Among these, the highest coefficient relates to the neuroticism dimension (-.11), indicating that higher levels of neurotic behaviors in an individual are expected to lead to functional disability, part of this effect occurring through reduced self-care.

4. Discussion and Conclusion

The aim of the current study was to predict functional disability in functional somatic syndromes in patients with coronary artery disease based on personality traits and illness perception, considering the mediating role of self-care behavior. The results showed that personality traits directly affect functional disability in functional somatic syndromes in patients with coronary artery disease. These findings are consistent with the previous research (Bagherian-Sararoudi et al., 2020; Mouzas et al., 2014; Nafisi et al., 2019; Pourmohammad et al., 2017).

In explaining the role of personality traits on the criterion variable indirectly, considering the mediating role of self-care, the findings indicate that all five personality dimensions have a significant effect on the functional disability variable when considering the mediating role of self-care. Self-care behavior plays the most significant mediating role through the dimension of agreeableness on the functional disability variable. It is also noteworthy that the indirect relationship of neuroticism is positive, and the other four dimensions have a significant negative relationship with the functional disability variable, which is confirmed by other related research and consistent with previous studies (Fadaei et al., 2020; Ruocco et al., 2014). The research findings regarding the role and nature of the relationship between illness perception and the criterion variable indirectly, through the mediating role of self-care behavior, indicate that illness perception has an indirect effect on functional disability in functional somatic syndromes in patients with coronary artery disease based on the mediating role of self-care behavior. Therefore, it can be stated that accurate illness perception can lead to an increase in self-care behaviors in the patient and thereby reduce the functional disability of patients with coronary artery disease. This positive significant relationship aligns with the findings of other previous research (Amegbor et al., 2018; Eydi et al., 2020; Parsamehr et al., 2015).

In conclusion, it can be stated that each of the variables of personality traits, illness perception, and self-care affects the functional disability of patients with coronary artery disease, and the presence of a direct relationship between them and the criterion variable in this research is proven. It is noteworthy that in addition to examining and analyzing the direct impact of personality traits and illness perception on the criterion variable, this research also delved into these two variables and examined their relationship with the criterion variable indirectly through the effectiveness on the mediating variable (self-care behavior) and determined that personality traits and illness perception, in addition to having a direct impact on the criterion variable, also indirectly affect functional disability in patients with coronary artery disease through their impact on the mediating variable. Therefore, considering that all hypotheses of the research were

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precisely and empirically examined and scientifically scrutinized, and also considering that the research results were matched and analyzed with similar studies which confirmed the findings of this research, the results obtained can be trusted.

5. Limitations & Suggestions

Limitations of this study include its cross-sectional design, which limits the ability to infer causality between personality traits, illness perception, self-care behavior, and functional disability. The sample was drawn from a specific geographic area, which may affect the generalizability of the findings to other populations. Additionally, the reliance on self-reported measures could introduce bias, as participants might respond in socially desirable ways or may not accurately recall their behaviors and perceptions.

For future research, longitudinal studies are recommended to better understand the causal relationships among personality traits, illness perception, self-care behavior, and functional disability in patients with coronary artery disease. It would be beneficial to replicate the study in diverse geographical and cultural settings to enhance the generalizability of the findings. Future studies could also incorporate objective measures of self-care behaviors and functional disability to reduce the potential bias associated with self-report measures. Exploring the impact of additional psychological variables, such as coping strategies and social support, could provide a more comprehensive understanding of the factors influencing functional disability in this population.

The findings of this study have important implications for clinical practice. Healthcare providers should consider the psychological aspects of coronary artery disease management, including personality traits and illness perception, as these factors can significantly influence patients' self-care behaviors and functional outcomes. Tailoring interventions to address these psychological factors, alongside traditional medical treatment, could enhance patient engagement in self-care practices and potentially reduce functional disability. Additionally, integrating psychological assessments into routine care for patients with coronary artery disease could help identify individuals at risk for poor self-care and functional outcomes, allowing for early intervention.

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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 in this article.

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