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Mediating Effects of Depressive Symptoms and Uncertainty on Physical Symptoms and Self-Care in Korean Older Men With Heart Failure

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ABSTRACT

Background: Heart failure is prevalent among aging populations. Given the increasing median age in many countries, sustainably improving self-care behaviors in heart failure patients is crucial. Physical symptoms predict self-care in patients with heart failure, whereas psychological factors such as depressive symptoms and uncertainty negatively affect disease management efficacy.

Purpose: The mediating and indirect effects of depressive symptoms and disease uncertainty regarding the relationship between physical symptoms and self-care behaviors were examined in older South Korean men with heart failure.

Methods: A descriptive correlational survey design was used to collect data from 185 older men with heart failure. Data were obtained from medical records and self-reported questionnaires addressing physical symptoms, depressive symptoms severity (Patient Health Questionnaire-9), illness uncertainty (Mishel Uncertainty in Illness Scale-Community Form), and self-care behaviors (European Heart Failure Self-care Behavior Scale). The mediating effects of depressive symptoms and disease uncertainty were assessed using a bootstrapping method via PROCESS Model 4, a parallel mediation model, in SPSS.

Results: The mean age of the participants was 77.41 (*SD* = 5.35) years. Half (50.8%) had a diagnosis of New York Heart Association Class II heart failure, and 21.6% had a diagnosis of New York Heart Association Class III/IV heart failure. Self-care behaviors were found to correlate negatively with physical symptoms, depressive symptoms, and uncertainty. Depressive symptoms (*B* = −0.10, 95% confidence interval [CI] [−0.18, −0.01]) and uncertainty (*B* = −0.05, 95% CI [−0.09, −0.01]) were found to mediate the relationship between physical symptoms and self-care behaviors.

Conclusions/Implications for Practice: The findings reveal depressive symptoms and disease uncertainty significantly mediate the relationship between physical symptoms and self-care behaviors in older South Korean men with heart failure. In light of this, cardiovascular nurses should join in targeted educational initiatives tailored to address the unique needs of older men with heart failure that consider psychological factors such as depressive symptoms and uncertainty as well as physical symptom management.

KEY WORDS:
depression, heart failure, self-care, uncertainty, aged.

Introduction

Heart failure affects approximately 64 million people worldwide and is marked by high rates of morbidity and mortality (Savarese et al., 2023). Heart failure treatments aim to alleviate symptoms and improve survival (Heidenreich et al., 2022). Despite significant improvements in heart failure therapies over the past 20 years, the prognosis for people with heart failure remains poor (Groenewegen et al., 2020; Park et al., 2021). Heart failure risk factors are more prevalent in older adults (Park et al., 2021). Thus, the condition is widespread among older adults and is a leading cause of hospitalization and readmission (Groenewegen et al., 2020), which aggravates healthcare problems among older adults and creates social and economic burdens. Therefore, heart failure conditions must be managed effectively (Park et al., 2021).

Physical symptoms, including dyspnea, orthopnea, fatigue, edema, peripheral swelling, and weight gain (Sethares et al., 2021), are key predictors of self-care in patients with heart failure (Riegel et al., 2022). It is crucial that patients with heart failure accurately recognize and manage their symptoms and report symptom worsening to medical staff to ensure timely treatment at an early stage (Jaarsma et al., 2021). However, people with heart failure may face difficulties recognizing symptoms of disease exacerbation because of the complex and diverse nature of this condition (Santos et al., 2020). Moreover, comorbidities and symptoms of

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aging are difficult to distinguish from heart failure symptoms, which further complicates symptom assessment (Riegel et al., 2022; Santos et al., 2020) and may delay the implementation of self-care activities such as symptom management and reporting to medical staff, potentially resulting in disease exacerbation and life-threatening emergencies (Riegel et al., 2022).

The American Heart Association has identified depression as a factor that may impede self-care in patients with heart failure (Riegel et al., 2022). Approximately 25%–50% of patients with heart failure exhibit depressive symptoms (Graven et al., 2020), with this percentage significantly higher in the presence of concomitant physical symptoms (C. Chen et al., 2020). Depressive symptoms in people with heart failure negatively impact self-care activities such as medication and dietary regimen adherence (Chuang et al., 2019). Depressive symptoms are frequently observed in people with heart failure but are often overlooked and not properly managed due to their psychological nature (Heo et al., 2019).

Uncertainty regarding symptom severity is a major factor that negatively affects individuals with heart failure (Sethares et al., 2021). Uncertainty arises when cognitive structure cannot be formed because of failure to understand the implications of a disease-related event accurately (Mishel, 1988). Heart failure is characterized by periodic exacerbation accompanied by physical symptoms and an uncertain illness trajectory (Sethares et al., 2021). The uncontrollable and diverse nature of heart failure symptoms may lead to repeated hospitalization and social isolation (T. Y. Chen et al., 2018; Sethares et al., 2021), whereas symptomatic pain may increase illness uncertainty (Sethares et al., 2021). Illness uncertainty arises from the complexity associated with managing multiple diseases and lack of understanding regarding the course of an unpredictable disease (Etkind et al., 2017). This uncertainty acts as a psychosocial stressor and affects recovery and compliance with self-care activities in people with heart failure (Etkind et al., 2017; Lee & Kang, 2020; Mishel, 1988).

Previous studies have found physical symptoms in patients with heart failure to be independently associated with depressive symptoms, uncertainty, and self-care behaviors. Increased physical symptoms lead to more depressive symptoms (Zhao et al., 2023), whereas depression is a predictor of self-care practice (Tegegn et al., 2021). Because people with heart failure are prone to psychological problems such as depression, which are associated with negative outcomes (C. Chen et al., 2020; T. Y. Chen et al., 2018), identifying and managing psychological factors that may affect self-care behaviors is vital (Heo et al., 2019). Similarly, physical symptoms correlate positively with uncertainty, which is known to affect self-care behaviors (Lee & Kang, 2020). The separate and combined effects of uncertainty and depressive symptoms as mediators require thorough exploration, as understanding these distinct impacts is key to developing tailored interventions. However, to the best of the authors' knowledge, no previous studies have investigated the mediating effects of depressive symptoms and uncertainty on the relationship between physical symptoms and self-care behaviors in individuals with heart failure. Furthermore, understanding the comparative impacts of these mediators on self-care behaviors can inform the development of tailored interventions, particularly for older men with heart failure, who often face challenges in managing their condition.

Although the importance of alleviating physical symptoms in patients with heart failure and reducing the impacts of uncertainty and depressive symptoms on disease management is understood (T. Y. Chen et al., 2018), older adults with heart failure often experience difficulties in self-care (Riegel et al., 2022). Furthermore, being male is a known negative predictor of self-care behaviors (Pobrotyn et al., 2021), with men having at least a 4.66-times higher risk than women of exhibiting poor self-care behaviors (Baymot et al., 2022). Moreover, as the crude prevalence of heart failure in South Korea is higher in men than women (Park et al., 2021) and older men (>65 years old) with heart failure face the highest mortality risk in Taiwan (Wu et al., 2020), addressing self-care in men with heart failure is important.

In light of the above, this study was conducted to examine the potential mediating effects of two psychological factors, uncertainty and depressive symptoms, on the relationship between physical symptoms and self-care behaviors in South Korean older men with heart failure.

Methods

Research Design, Sample, and Setting

This descriptive correlational study was conducted in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology guidelines. Older men (≥ 65 years old) with heart failure attending the cardiology outpatient clinic at the Seoul Veterans Hospital, Seoul, South Korea, were recruited as participants from January 4 to April 14, 2022.

Inclusion criteria included men (a) aged 65 years or over, (b) diagnosed with heart failure by a cardiologist, (c) free of psychiatric or cognitive problems that could interfere with their ability to communicate, and (d) capable of completing the study questionnaire. Qualified patients who volunteered to participate in the study after sufficiently understanding the study purpose were enrolled as participants. Otherwise qualified patients with a dementia or cognitive impairment diagnosis and those who were terminally ill with cancer or primary organ failure were excluded.

The required sample size was calculated using the G*Power 3.1.9.7 program (https://www.psychologie.hhu.de/arbeitsgruppen/allgemeine-psychologie-und-arbeitspsychologie/gpower). The effect size was estimated based on the coefficient of determination (R^2) of the regression equation estimated in a previous study on the self-care behaviors of patients with heart failure (Lee & Kang, 2020). A minimum sample size of 161 was calculated for the regression analysis, with the effect size set to f^2 = .19,

significance level (α) set to .05, power (1 – β) set to 90%, and the number of predictor variables set to 22. The predictor variables considered included age, educational level, marital status, employment status, family living arrangement, monthly income, caregiver details, heart failure education, disease duration, hospitalization during the past year, emergency room visits during the past year, New York Heart Association (NYHA) functional classification, body mass index, etiology of heart failure, left ventricular ejection fraction (LVEF), N-terminal pro-brain natriuretic peptide level, number of medications, cardiac surgery history (coronary artery bypass grafting, aortic valve operation), Charlson Comorbidity Index score, physical symptoms, depressive symptoms, and uncertainty. The minimum sample size was increased to account for an estimated 20% rate of withdrawal, resulting in a target sample size of 201. After convenience sampling, 194 completed questionnaires were received and, after eliminating nine due to incomplete responses and responses from patients who fell short of the inclusion criteria, leaving data from 185 questionnaires available for analysis.

Measurements

1. General and disease-related characteristics: The general and disease-related characteristics of patients were assessed using the questionnaire data and medical records. The data collected included age, marital status, educational level, employment status, family living arrangement, monthly income, caregiver details, heart failure education, disease duration, hospitalization during the past year, visits to the emergency room during the past year, NYHA functional classification, height and weight, etiology of heart failure, LVEF, N-terminal pro-brain natriuretic peptide level, number of medications, cardiac surgery history (coronary artery bypass grafting and aortic valve operation), and Charlson Comorbidity Index score.
2. Physical symptoms: The physical symptoms experienced by patients with heart failure were measured using a 14-item scale developed by Kim (2007), with items including dyspnea such as orthopnea and paroxysmal nocturnal dyspnea, edema, decreased appetite, nausea, chest pain/discomfort, dizziness, fatigue, weight change, and sleeping difficulties. Each item is rated on a 4-point Likert scale, with scores for each of the physical symptom items ranging from 1 (*I never experience this symptom*) to 4 (*I often experience this symptom*). The total possible scale score ranges from 14 to 56 points, with higher scores indicating a higher symptom experience frequency and greater discomfort. The reliability of this scale was assessed as a Cronbach's α of .75 at the time of development (Kim, 2007) and .85 in this study.
3. Depressive symptoms: Depressive symptom severity was measured using the nine-item Korean version of the Patient Health Questionnaire-9 (Han et al., 2008; Spitzer et al., 1999). The Patient Health Questionnaire-9 is scored on a 4-point Likert scale, with higher total scores (range: 0–27) indicating greater symptom severity. Scale reliability, determined using Cronbach's α, was .85 at the time of development (Spitzer et al., 1999) and was .86 in this study.
4. Uncertainty: Illness uncertainty was measured using the Korean version of the Mishel Uncertainty in Illness Scale-Community Form (MUIS-C) developed by Mishel (Mishel, 1988; Oh, 1993). The 23-item MUIS-C targets community-dwelling, chronically ill patients and their families. The form is scored on a 5-point Likert scale, with positive items reverse scored. A higher total score (range: 23–115 points) indicates greater uncertainty. The reliability of the MUIS-C, also determined using Cronbach's α, was .74–.92 at the time of development (Mishel, 1988) and was .77 in this study.
5. Self-care behaviors: Self-care behaviors were measured in this study using the Korean version of Jaarsma's European Heart Failure Self-care Behavior Scale-12 (Jaarsma et al., 2003; Ok et al., 2013). This 12-item scale was designed to assess the self-care activities, diet, exercise, medication adherence, and symptom self-management efficacy (e.g., fatigue, dyspnea, and edema) of patients with heart failure. Satisfactory validity and reliability for the older 12-item version were also reported in a recent review (Sedlar et al., 2017). Each item is rated on a 5-point Likert scale, with higher total scores (range: 12–60 points) indicating poorer self-care behaviors. However, to achieve a better and more intuitive understanding, the European Heart Failure Self-care Behavior Scale-12 item scores were reversed in this study. Thus, higher scale scores indicate higher levels of self-care behaviors (Müller-Tasch et al., 2018). The reliability of this scale was calculated as a Cronbach's α of .81 at the time of development (Jaarsma et al., 2003) and .70 in this study.

Ethical Considerations

This study was approved by the institutional review board of the hospital in which the research was conducted (Approval No. BOHUN 2021-11-004-004). All of the participants were informed about the research purpose and methods, the time required for participation, the privacy and confidentiality of their information, and their right to withdraw from the study at any time without incurring any disadvantage. They were also told that all data collected would be used for the purposes of this study only.

Procedures

The study purpose and content were explained to the seven cardiologists and four outpatient nurses involved in data collection. One of the researchers comprehensively explained the purpose of the study to the patients awaiting outpatient treatment. Only those patients who expressed willingness to participate voluntarily were enrolled as participants. The researcher then asked the participants to complete the questionnaires to assess their physical and depressive symptoms,

illness uncertainty, and self-care behaviors. The participants who had difficulty reading any of the questionnaires were assisted by a researcher, who read the questionnaire out loud and recorded the participant's responses in writing. The survey took approximately 15–20 minutes to complete. The researcher reviewed medical records to assess exclusion criteria and disease-related characteristics.

Data Analysis

The data were analyzed using the IBM SPSS/WIN 27.0 and SPSS PROCESS macro (Version 4.3) programs. Participant characteristics were presented as frequency, percentage, mean and standard deviation, and median and interquartile range. Independent *t* tests and one-way analysis of variance were performed to examine the differences in self-care behaviors according to participants' general and disease-related characteristics. Post hoc analysis was conducted using Scheffe's test. Pearson's coefficients were calculated to determine correlations between physical symptoms, illness uncertainty, depressive symptoms, and self-care behaviors. Multicollinearity was evaluated for all values based on a variance inflation factor < 10, with tolerance > 0. The correlation coefficients between independent variables did not exceed .9. Also, the Durbin–Watson values ranged from 1.707 to 1.792, indicating residuals were not affected by autocorrelation.

To test the mediating effects and compare the indirect effects of depressive symptoms and uncertainty on the relationship between physical symptoms and self-care behaviors, bootstrapping was conducted using Model 4, that is, the parallel multiple mediation model developed by Hayes (2017), in the PROCESS macro in SPSS (IBM SPSS Inc., Armonk, NY, USA). Variables found to have a statistically significant effect on self-care behaviors based on univariate analyses were included in the mediation analysis as covariates. The statistical significance of the indirect effect was evaluated using the PROCESS macro with 10,000 bootstrap samples, and a bootstrap bias-corrected 95% confidence interval (CI) was estimated. In this study, statistical significance was determined at $p < .05$.

Results

Differences in Self-Care Behaviors According to Participant Characteristics

A total of 185 males (mean age: 77.41 ± 5.35 years) were enrolled as participants in this study. Their heart-failure-related characteristics are summarized in Table 1. One hundred fifty-two (82.2%) had never received heart failure education. About half of the patients had experienced NYHA Class II heart failure. The etiology of heart failure among the participants was split about 50/50 between nonischemic and ischemic heart failure.

Having a higher educational level, higher monthly income, and cardiac surgery history were found to be associated with statistically significantly higher self-care behaviors (Table 1). Levels of self-care behavior were also better in those with an LVEF of 40%–49% than in those with an LVEF of ≥ 50% ($p = .011$; Table 1).

Mean Scores and Correlation Coefficients for Physical Symptoms, Depressive Symptoms, Uncertainty, and Self-Care Behaviors

The mean scores for physical symptoms, depressive symptoms, uncertainty, and self-care behaviors as well as interfactor correlations are shown in Table 2. Physical symptoms were found to be significantly positively correlated with depressive symptoms and uncertainty (both *p*s < .001) and significantly negatively correlated with self-care behaviors ($p = .012$). Depressive symptoms were significantly positively correlated with uncertainty ($p < .001$) and negatively correlated with self-care behaviors ($p < .001$). Uncertainty was significantly negatively correlated with self-care behaviors ($p < .001$).

Mediating Effects of Depressive Symptoms and Uncertainty on the Relationship Between Physical Symptoms and Self-Care Behaviors

The indirect effects of depressive symptoms and uncertainty on the relationship between physical symptoms and self-care behaviors were tested. Educational level, monthly income, LVEF, and cardiac surgery history were found to affect self-care behaviors significantly and were included as covariates.

The final mediating effect results are presented in Tables 3 and 4 and in Figure 1. The total effect of physical symptoms on self-care behaviors was found to be significant (path c: $B = -0.14$, $p = .013$, 95% CI [–0.25, –0.03]) after adjusting for the covariates (educational level, monthly income, LVEF, and cardiac surgery history). The direct effects of physical symptoms on depressive symptoms (path a_1: $B = 0.48$, $p < .001$, 95% CI [0.39, 0.56]) and of depressive symptoms on self-care behaviors (path b_1: $B = -0.20$, $p = .047$, 95% CI [–0.40, –0.01]) were also significant after adjusting for covariates. The direct effects of physical symptoms on uncertainty (path a_2: $B = 0.40$, $p < .001$, 95% CI [0.22, 0.57]) and of uncertainty on self-care behaviors (path b_2: $B = -0.12$, $p = .020$, 95% CI [–0.22, –0.02]) were likewise significant after adjusting for covariates. The direct effects of physical symptoms on self-care behaviors (path c': $B = 0.01$, $p = .976$, 95% CI [–0.14, 0.14]) were not found to be significant after adjusting for mediators and covariates (Table 3 and Figure 1).

However, the indirect effects of both depressive symptoms (path a_1b_1: $B = -0.10$, 95% CI [–0.18, –0.01]) and uncertainty (path a_2b_2: $B = -0.05$, 95% CI [–0.09, –0.01]) were statistically significant and did not include 0 in the 95% CI (Table 4). The difference between the two indirect effect

Table 1

Differences in Participant Self-Care Behaviors by General and Disease-Related Characteristics (N = 185)

Variable	*n*	%	*M* ± *SD* or Median (IQR)	Self-Care Behaviors	
				M ± *SD*	*t*/*F*(*p*) Scheffé
Age (years)			77.41 ± 5.35		0.35 (.727)
≤ 77	121	65.4		44.84 ± 6.60	
> 77	64	34.6		44.48 ± 6.73	
Educational level					–2.76 (.006)
≤ Middle school	77	41.6		43.16 ± 6.14	
≥ High school	108	58.4		45.83 ± 6.77	
Marital status					1.01 (.314)
Married	155	83.8		44.94 ± 6.61	
Single/widowed/divorced	30	16.2		43.60 ± 6.73	
Family living arrangement					0.76 (.451)
Living alone	26	12.9		44.87 ± 6.43	
Not living alone	159	85.9		43.81 ± 7.78	
Monthly income (KRW, approx. USD)					–2.45 (.015)
≤ 1.7 million won ($1,250)	93	50.3	1.7 million ($1,250)	43.55 ± 6.59	
> 1.7 million won ($1,250)	92	49.7	1.5 million ($1,102)	45.90 ± 6.48	
Employed					0.18 (.859)
No	164	88.6		44.75 ± 6.62	
Yes	21	11.4		44.48 ± 6.84	
Caregiver					0.67 (.505)
No	106	57.3		45.00 ± 7.12	
Yes	79	42.7		44.34 ± 5.92	
Heart failure education					–0.76 (.448)
No	152	82.2		44.55 ± 6.74	
Yes	33	17.8		45.52 ± 6.13	
Disease duration			4.03 ± 3.66		1.55 (.123)
≤ 4 years	125	67.6		45.24 ± 6.77	
> 4 years	60	32.4		43.63 ± 6.23	
Body mass index (kg/m^2)			23.58 ± 3.63		0.33 (.742)
< 25	133	71.9		44.82 ± 6.22	
≥ 25	52	28.1		44.46 ± 7.62	
Hospitalization during past year					1.07 (.285)
No	123	66.5		45.09 ± 6.87	
Yes	62	33.5		43.98 ± 6.09	
ER visit during the past year					0.86 (.392)
No	123	66.5		45.02 ± 6.93	
Yes	62	33.5		44.13 ± 6.00	
NYHA functional classification					0.48 (.621)
NYHA I	51	27.6		45.49 ± 6.49	
NYHA II	94	50.8		44.46 ± 6.88	
NYHA III/IV	40	21.6		44.35 ± 6.26	
Etiology of heart failure					–0.75 (.454)
Nonischemic	93	50.3		44.35 ± 7.16	
Ischemic	92	49.7		45.09 ± 6.06	
LVEF (%)			41.57 ± 11.57		4.65 (.011)
① < 40	95	51.4		44.57 ± 6.39	③ < ②
② 40–49	40	21.6		47.20 ± 6.95	
③ ≥ 50	50	27.0		43.02 ± 6.33	

(continues)

Table 1

Differences in Participant Self-Care Behaviors by General and Disease-Related Characteristics (N = 185), Continued

Variable	*n*	%	*M* ± *SD* or Median (IQR)	Self-Care Behaviors	
				M ± *SD*	*t*/*F*(*p*) Scheffé
NT-proBNP (pg/mL)			615.10 (1601.00)		1.19 (.235)
< 500	78	42.2		45.40 ± 6.69	
≥ 500	107	57.8		44.22 ± 6.57	
Cardiac surgery history					−2.85 (.005)
No	160	86.5		44.18 ± 6.59	
Yes (CABG, aortic valve operation)	25	13.6		48.16 ± 5.87	
CCI score (points)			2.88 ± 1.56		0.40 (.690)
≤ 2	89	48.1		44.92 ± 6.42	
> 3	96	51.9		44.53 ± 6.84	
Medications (*n*)			5.14 ± 1.60		−0.76 (.450)
≤ 5	108	58.4		44.41 ± 6.70	
> 5	77	41.6		45.16 ± 6.55	

Note. CABG = coronary artery bypass grafting; CCI = Charlson Comorbidity Index; ER = emergency room; IQR = interquartile range; KRW = Korean won; approx. USD = approximate United States dollar value; ER = emergency room; NYHA class = New York Heart Association function class; LVEF = left ventricular ejection fraction; NT-proBNP = N-terminal pro-brain natriuretic peptide.

sizes was $B = -0.05$, indicating a larger mediating effect for depressive symptoms. However, this difference was not statistically significant because 0 was included in the 95 % CI (Table 4).

Discussion

This study was conducted to assess the mediating effects of depressive symptoms and disease uncertainty on the relationship between physical symptoms and self-care behaviors in South Korean older men with heart failure. Both variables were found to have a significant mediating effect on this relationship, suggesting that nursing interventions should appropriately address depressive symptoms and uncertainty to promote self-care behaviors in this patient population.

Physical symptoms were shown to correlate significantly and negatively with self-care behaviors, with more physical symptom incidences associated with a lower likelihood of performing self-care behaviors. This finding supports the results of a previous study (Graven et al., 2015). Because evaluating physical symptoms and adhering to self-care behaviors are essential for heart failure management (Auld et al., 2018), nurses should consider all of the physical symptoms of older men with heart failure when assessing their conditions. Furthermore, because good self-care is essential to improving patient outcomes, including quality of life, risk of mortality, and readmission rates (Jaarsma et al., 2021), practitioners should assess level of self-care in older men with heart failure. However, the tendency of older adult patients to attribute symptoms to aging rather than current health condition can complicate the accurate evaluation of their physical symptoms (Riegel et al., 2022; Santos et al., 2020). Customized nurse-administered education programs and interventions that provide older adult patients with the training necessary are needed to help them recognize the physical symptoms of heart disease, distinguish these from normal

Table 2

Mean Scores and Correlation Coefficients of Physical Symptoms, Depressive Symptoms, Uncertainty, and Self-Care Behaviors (N = 185)

Variable	Range	Mean	*SD*	Physical Symptoms	Depressive Symptoms	Uncertainty	Self-Care Behaviors
				r (*p*)	*r* (*p*)	*r* (*p*)	*r* (*p*)
Physical symptoms	14–56	30.87	8.33	1			
Depressive symptoms	0–27	7.39	6.49	.63 (< .001)	1		
Uncertainty	23–115	67.54	10.66	.32 (< .001)	.53 (< .001)	1	
Self-care behaviors	12–60	44.72	6.28	−.19 (.012)	−.33 (< .001)	−.33 (< .001)	1

Table 3

The Mediating Effects of Depressive Symptoms and Uncertainty on the Relationship Between Physical Symptoms and Self-Care Behaviors (N = 185)

Variable	Depressive Symptoms				Uncertainty				Self-Care Behaviors			
Predictors	**Path**	**Coeff**	***SE***	***p***	**Path**	**Coeff**	***SE***	***p***	**Path**	**Coeff**	***SE***	***p***
Educational level		2.84	0.73	< .001		4.76	1.48	.001		−1.42	0.95	.138
Cardiac surgery history		−.984	1.07	.374		−1.72	2.16	.426		3.35	1.33	.013
LVEF		−0.01	0.03	.948		0.03	0.06	.694		−0.03	0.04	.039
Monthly income		−0.01	0.01	.002		−0.01	0.01	.076		0.01	0.01	.220
Physical symptoms	a_1	0.48	0.04	< .001	a_2	0.40	0.08	< .001	c'	0.01	0.07	.976
Depressive symptoms									b_1	−0.20	0.10	.047
Uncertainty									b_2	−0.12	0.05	.020
Constant		−8.32	2.02	< .001		52.54	4.09	< .001		55.63	3.95	< .001
		R^2 = .44				R^2 = .16				R^2 = .19		
		F = 35.66, p < .001				F = 8.28, p < .001				F = 6.84, p < .001		

Note. Adjusted for educational level, cardiac surgery history, left ventricular ejection fraction, and monthly income. Coeff = coefficient; *SE* = standard error; LVEF = left ventricular ejection fraction.

aging symptoms, and self-manage their symptoms (Riegel et al., 2022; Sethares et al., 2021).

In this study, physical symptoms were shown to correlate significantly and positively with depressive symptoms, which is consistent with the results of previous studies that found patients with more physical symptoms experienced more depressive symptoms (e.g., T. Y. Chen et al., 2018; Zhao et al., 2023). Both physical symptoms and psychological symptoms (e.g., depressive symptoms) frequently and severely affect people with heart failure (Graven et al., 2020). Given that psychological symptoms such as depressive symptoms increase with the severity and diversity of physical symptoms, both symptom categories should be addressed simultaneously (T. Y. Chen et al., 2018; Heo et al., 2019). Notably, the mean depressive symptom score of the participants in this study was markedly higher than that of adult men in a previous study (Heo et al., 2019). In light of the importance of recognizing and managing psychological symptoms such as depressive symptoms, strategies that identify and improve these symptoms should be implemented to improve physical symptoms in older men with heart failure (Heo et al., 2019). Related strategies may include providing education designed to improve patient heart-failure-symptom coping efficacy (Freedland et al., 2021; Riegel et al., 2022), screening for depression, using self-reported questionnaires to assess mental health accurately and identify problems, asking patients about work and financial concerns that may aggravate psychological responses, providing age-appropriate information, and involving the family (Jaarsma et al., 2021).

Also, physical symptoms were found to correlate significantly and positively with level of disease uncertainty. This finding echoes those of previous studies (e.g., T. Y. Chen et al., 2018; Lee & Kang, 2020). Heart failure, characterized by repeated phases of exacerbation and remission, is considered a chronic and incurable disease (Heidenreich et al., 2022). In the course of disease management and treatment,

Table 4

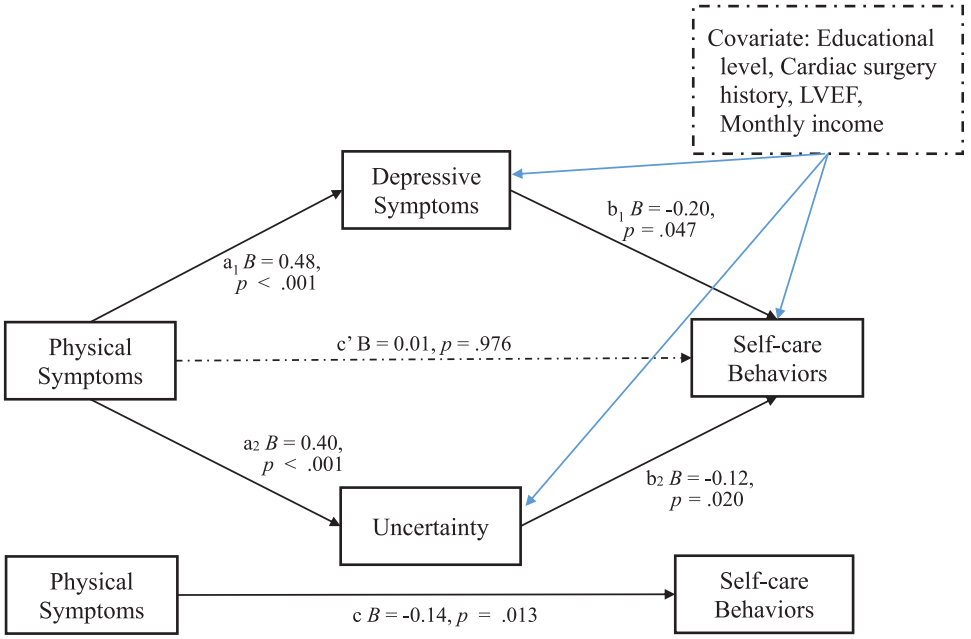
Indirect Effects on Self-Care Behaviors With 95% Bootstrap Confidence Interval (N = 185)

Variable	Product of Coefficient		95% Bootstrap CI
	Point Estimate	**Bootstrap *SE***	
Indirect effect on Y	−0.14	0.04	[−0.23, −0.06]
$a_1 \times b_1$ (physical symptoms → depressive symptoms → self-care behaviors)	−0.10	0.04	[−0.18, −0.01]
$a_2 \times b_2$ (physical symptoms → uncertainty → self-care behaviors)	−0.05	0.02	[−0.09, −0.01]
Comparison of indirect effects on self-care behaviors	−0.05	0.05	[−0.16, 0.06]

Note. SE = standard error; CI = confidence interval.

Figure 1

The Mediation Model of Depressive Symptoms and Uncertainty on the Relationship between Physical Symptoms and Self-Care Behaviors



Note. LVEF = left ventricular ejection fraction. The dashed frame in the upper right corner represents covariates (educational level, cardiac surgery history, LVEF, and monthly income). The three arrows from this frame indicate their influence on depressive symptoms, uncertainty and self-care behaviors.

heart disease may be aggravated by unpredictable circumstances as well as by natural disease progression, leaving patients vulnerable to stress and uncertainty (Etkind et al., 2017; Mishel, 1988). The mean uncertainty score in this study was markedly higher than that reported for adults in a previous study (Lee & Kang, 2020). Older adult patients may experience higher levels of uncertainty due to the complexity of managing multiple diseases, disease unpredictability, inadequate symptom and disease knowledge, and senility (Etkind et al., 2017; Sethares et al., 2021). People with heart failure experience moderate-to-severe disease uncertainty due to the complex symptoms related to the condition (T. Y. Chen et al., 2018), with older men with inadequate symptom and disease knowledge particularly vulnerable. This highlights the need for nurse-administered educational programs to manage illness uncertainty by providing older male patients with personalized information, including educational materials on coping strategies. Previously identified intervention components that decreased uncertainty provided resources and information, coping skills training, social and emotional support, communication skills, symptom management, self-care information, coordination of care, exercise, and person-centered care (Khanipour-Kencha et al., 2023; Zhang et al., 2020). Intervention strategies that provide clear and accurate communication to people with heart failure have been shown to reduce uncertainty (Schichtel et al., 2021).

Although the direct effect of physical symptoms on self-care behavior was not significant, the total effect was significant. This emphasizes the complexity of heart failure management in terms of the significant role played by mediators such as emotional and psychological factors (Chuang et al., 2019). In clinical practice, this highlights the need for multidimensional interventions, including addressing patient psychological issues, to effectively improve self-care in heart failure patients.

In this study, depressive symptoms were shown to have an indirect mediating effect on the relationship between physical symptoms and self-care behaviors. Furthermore, higher physical symptom severity was associated with more severe depressive symptoms, which indirectly exerts a negative effect on self-care behaviors (T. Y. Chen et al., 2018; Tegegn et al., 2021). This suggests interventions with a greater focus on depressive symptoms are needed to improve older males' physical symptoms and promote self-care behaviors. Depressive symptoms in people with heart failure contribute to increased rates of hospitalization and readmission and a reduced quality of life (T. Y. Chen et al., 2018; Graven et al., 2020). Furthermore, depressive symptoms negatively affect treatment adherence in people with heart failure and impede their ability to recognize symptoms and respond to them

appropriately (Jaarsma et al., 2021; Santos et al., 2020), which in turn interferes with self-care behaviors and thus delays timely consultation and treatment (Chuang et al., 2019; Khayati et al., 2020). Interventions such as physical exercise, meditation, stress management, and relaxation have been shown to improve depressive symptoms and thus psychological status in these patients (Gok Metin et al., 2018). Moreover, recent studies underline the importance of effectively managing depressive symptoms to enhance self-care abilities in heart failure patients. Interventions based on cognitive-behavioral therapy principles are particularly emphasized due to their focus on the mediating effects of depressive symptoms on self-care capabilities (Khayati et al., 2020). Nurses are positioned to identify patients at risk for depressive symptom early on and to provide timely information about symptom management interventions (Graven et al., 2020). Hence, both depressive and physical symptoms in older men with heart failure should be carefully monitored, and depressive symptoms intervention programs should be administered as needed to patients along with the provision of educational material on self-care behaviors.

Similar to depressive symptoms, uncertainty was found to have an indirect mediating effect on the relationship between physical symptoms and self-care behaviors. Physical symptom severity and a higher levels of uncertainty are indicative of lower adherence to self-care behaviors (Lee & Kang, 2020). This suggests that interventions with a greater focus on uncertainty are needed to improve older male patients' physical symptoms and to promote self-care behaviors. Inadequate information on the illness and the difficulties associated with identifying and interpreting unexpected symptoms can increase uncertainty and reduce the effective practice of self-care behaviors (Sethares et al., 2021). Each patient's priorities are different. Thus, each requires an individually tailored approach (Schichtel et al., 2021). These approaches should be designed to use education to empower older men with heart failure facing a variety of heart failure symptoms to foster a better understanding of their disease course and symptoms as well as promote greater self-management and adaptation capabilities.

Furthermore, the observed nonsignificant difference in the indirect effect sizes between depressive symptoms and uncertainty underlines the critical need for a deeper understanding of the impact of these psychological factors on self-care behaviors in heart failure patients. This understanding is imperative for the development of comprehensive, realistic, and patient-specific nursing interventions. These interventions should aim to assist patients in effectively managing not only their physical symptoms but also their depressive symptoms and uncertainty (T. Y. Chen et al., 2018). Therefore, explicitly focusing on these psychological aspects is essential, as this is likely to have a positive impact on self-care behaviors and overall health well-being in patients with heart failure.

Limitations

This study was affected by several limitations. First, the participants were recruited via convenience sampling from a single hospital in South Korea. Thus, the results cannot be directly generalized to all patients with heart failure. Future replications of this study will benefit from using larger sample sizes at multiple study sites. Second, self-reported questionnaires were used to measure the research variables (physical symptoms, depressive symptoms, uncertainty, and self-care behaviors). Given that subjective/faulty recollection may affect the overall outcome, caution is warranted when interpreting the results. Third, physical and psychological factors were the focus of this study. The impact of physical symptoms on self-care behaviors may be affected by variables not specifically measured, including the potential influence of male breadwinner ideology, which is especially relevant in older Asian adult populations. This cultural aspect may have affected participants' attitudes toward self-care but was not directly assessed in this study. Future studies should consider exploring this cultural dimension. Finally, the cross-sectional design of this study cannot explain the causal relationship between physical symptoms and self-care behaviors.

Nevertheless, this study is significant in terms of determining the mediating effects of depressive symptoms and disease uncertainty on the relationship between physical symptoms and self-care behaviors in South Korean older men with heart failure. The findings provide useful evidence for the development of nursing education materials that consider physical symptoms, depressive symptoms, and disease uncertainty in older men with heart failure.

Conclusions and Implications

The mediating effects of depressive symptoms and uncertainty on the relationship between physical symptoms and self-care behaviors in Korean older men with heart failure were investigated in this study. Depressive symptoms and uncertainty were found to have a significant mediating effect on the relationship between patient physical symptoms and self-care behaviors. Thus, to promote appropriate self-care behaviors, older men with heart failure should be provided with customized educational materials to help them recognize and manage their physical symptoms. Furthermore, psychological interventions focusing on depressive symptoms and disease uncertainty may greatly help older men with heart failure.

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Data analysis and interpretation: SY
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