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Research Article

Psychometric Testing of the Korean Version of the Self-Care of Coronary Heart Disease Inventory Version 3

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SUMMARY

Purpose: This methodological study evaluated the psychometric properties of the Self-Care of Coronary Heart Disease Inventory version 3 (SC-CHDI v3) in a Korean context.
Methods: The SC-CHDI v3 was translated into Korean following a rigorous translation process. Participants were 452 patients who had experienced coronary heart disease (CHD), all recruited from a tertiary hospital in Korea. Exploratory and confirmatory factor analyses were performed to test construct validity. Concurrent validity was examined by correlating scores from the Korean version of the SC-CHDI v3 with those from the Cardiac Self-Efficacy Scale. Internal consistency was analyzed using Cronbach's alpha and McDonald's omega.
Results: The Korean version of the SC-CHDI v3 consists of 21 items, excluding two from the original instrument. The self-care maintenance subscale identified a two-factor structure: "treatment adherence" and "health-promoting behaviors." The goodness-of-fit indices were satisfied: $\chi^2 = 18.19$, $p = .110$, comparative fit index (CFI) = .97, Tucker-Lewis Index (TLI) = .95, and standardized root mean square residual (SRMR) = .04. The self-care monitoring subscale consisted of a one-dimensional structure ("monitoring behaviors") and the goodness-of-fit indices were satisfied: $\chi^2 = 19.19$, $p = .059$, CFI = .99, TLI = .99, and SRMR = .04. The self-care management subscales had a two-factor structure of "consulting behaviors" and "problem-solving behaviors." The goodness-of-fit indices were satisfied: $\chi^2 = 16.44$, $p = .037$, CFI = .99, TLI = .98, and SRMR = .03. Scores from the Cardiac Self-Efficacy Scale showed a positive correlation with the Korean version of SC-CHDI v3 subscales. Reliability estimates were $\geq .80$ for all subscales except for the self-care maintenance subscale.
Conclusions: The Korean version of the SC-CHDI v3 consists of 21 items in 3 subscales and is a valid and reliable instrument. Therefore, healthcare providers can effectively utilize it to assess the self-care levels of patients with CHD.

Introduction

Coronary heart disease (CHD) is an ischemic heart disease characterized by insufficient oxygen supply to the myocardium, often resulting from the narrowing or occlusion of the coronary arteries [1,2]. Recently, the World Health Organization announced that CHD ranks as the number one cause of death worldwide [2]. In South Korea, heart disease is the top cause of death among single diseases, with the mortality rate from heart disease per 100,000 people increasing from 55.6 in 2015 to 65.8 in 2022, indicating a continuous annual rise [3]. Despite advancements in pharmaceutical development, coronary artery bypass surgery, and percuta-

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Abbreviations: CFA, Confirmatory Factor Analysis; CFI, Comparative Fit Index; CHD, Coronary Heart Disease; EFA, Exploratory Factor Analysis; KMO, Kaiser-Meyer-Olkin; MI, Modification Index; RMSEA, Root Mean Square Error of Approximation; SC-CHDI, Self-Care of Coronary Heart Disease Inventory; SRMR, Standardized Root-Mean-square Residual; TLI, Tucker-Lewis Index.

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neous coronary intervention, CHD is at high risk for recurrence, other cardiovascular events, or death [4,5]. Thus, self-care of patients with CHD is necessary to decrease mortality and morbidity and is an essential factor that is associated with interventions such as optimal drug treatment, healthy lifestyle changes, and cardiovascular risk factor control [4,5].

Based on the Middle Range Theory of Self-Care of Chronic Illness, self-care is "a process of decision-making in natural settings that involves the maintenance of health via practices that promote health and the management of chronic illness" [6,7]. It encompasses the actions taken by individuals with chronic conditions, such as CHD, to maintain their health and manage their illness effectively. Through self-care, patients can navigate their daily lives, enhance their health management skills, and address challenges arising from their condition [7,8]. Furthermore, as self-care proficiency increases, individuals experience improvements in daily functioning, perceive their health status more positively, and ultimately strive to improve their overall quality of life [4,9].

To devise intervention strategies to enhance the self-management capabilities of patients with CHD, a reliable tool is essential to sensitively and accurately assess their self-management abilities. The Self-Care of Coronary Heart Disease Inventory (SC-CHDI), developed by Vaughan Dickson et al. [10], is grounded in a theoretical framework specifically designed to measure the self-care practices of CHD patients [6]. The SC-CHDI is predicated on the Middle Range Theory of Self-Care of Chronic Illness, which differentiates self-care monitoring from the processes of self-care maintenance and management [6]. The second version of SC-CHDI (SC-CHDI v2) encompassed three subscales—self-care maintenance, management, and confidence—to offer a thorough assessment of self-care in patients with CHD, incorporating a confidence measure in self-management [10,11]. However, self-care confidence was recognized as going beyond a simple component of self-care and emerging as an essential determinant of self-care. Accordingly, in the third version of SC-CHDI (SC-CHDI v3), the self-care confidence scale was removed and reconfigured to reflect self-efficacy more accurately [10,11].

Unlike SC-CHDI v2, which integrated self-care monitoring within the self-care maintenance and management subscales, SC-CHDI v3 introduces self-care monitoring as an independent scale, thus reorganizing the inventory into three distinct subscales [10–12]. Additionally, the three items assessing self-care maintenance behaviors were revised to be more precise, and the "self-care monitoring" scale has been introduced in place of the "self-care confidence" subscale that was part of the SC-CHDI v2. Furthermore, the response format has been updated to a 5-point Likert scale from its previous 4-point version [10–12]. This adjustment highlights the importance of self-care monitoring and allows for a more nuanced evaluation.

The SC-CHDI v3 has been translated into several languages and utilized to evaluate self-care maintenance, management, and monitoring across diverse populations in Italy, Thailand, and China [12–14] (www.self-care-measures.com). However, the reliability and validity of a Korean version are yet to be established. This study aimed to provide a Korean translation of the SC-CHDI v3 and evaluate the reliability and validity of its components.

Methods

Study design

A methodological study evaluated the validity and reliability of the Korean version of SC-CHDI v3 by recruiting patients attending the outpatient cardiovascular clinic at tertiary healthcare in Korea.

Study participants

Participants were selected from among individuals diagnosed with CHD using a convenience sampling method. The inclusion criteria were: (a) aged 19 years or older; (b) having been diagnosed with CHD (including angina pectoris, myocardial infarction, stent placement, or coronary artery bypass grafting) by a cardiologist for more than a month (c) proficient in understanding and speaking Korean. Patients with cognitive impairments, dementia, psychiatric disorders, those currently on central nervous system medications, those suffering from other serious illnesses, or those who were considered very frail were excluded. Additionally, individuals recently hospitalized or underwent surgery, potentially affecting their self-care capacities, were excluded. Patients who had difficulty communicating were excluded.

Sample size

The SC-CHDI v3 is a 23-item instrument divided into three subscales measuring self-care maintenance, self-care monitoring, and self-care management [11]. Recommendations for minimum sample sizes generally suggest having at least 10 observations per item [15], and a sample size of at least 200 is required for adequate inference in exploratory or confirmatory analysis. Therefore, we enrolled 480 participants to account for potential attrition. Of these, 28 were excluded due to missing or incomplete responses. A total of 452 participants completed the questionnaires, achieving a 94.2% response rate.

Instrument

The self-care of coronary heart disease inventory

The 23 items are distributed across the three subscales as follows: self-care maintenance (nine items), self-care monitoring (seven items), and self-care management (seven items) [11]; the self-care maintenance subscale inquiries about the frequency with which patients adhere to general health practices, such as attending appointments, taking medications, and eating healthily. The self-care monitoring subscale assesses how often patients check aspects of their health, including blood pressure, side effects of medication, and weight. The self-care management subscale explores whether patients are likely to act in response to symptoms, such as by modifying their level of activity, taking additional medication, or contacting their healthcare provider. All questions within the three subscales are assessed on a 5-point Likert scale, where the scores vary between 1 and 5 [11].

For the SC-CHDI v3, the scoring process includes determining a standardized score for every scale. The scale's score is missing if respondents complete 50% of the items or fewer. Initially, a raw score for the scale is calculated, which is subsequently transformed into a standardized score ranging from 0 to 100, in line with the instructions provided at www.selfcare-measures.com.

The cardiac self-efficacy scale

The Cardiac Self-Efficacy Scale, developed by Sullivan et al. [16] and translated into Korean by Kang et al. [17], was utilized to assess concurrent validity within our study. This tool is designed to gauge the perceived self-efficacy of patients with CHD about managing their disease. It comprises 16 items, categorized into symptom control (10 items), functioning maintenance (four items), and two items focused on obesity and dietary habits. Each item is scored on a 5-point Likert scale (0 = not confident to 4 = completely confident). A higher aggregate score reflects greater self-efficacy. The validity of this instrument has been previously established in

Korean populations [17]. While Cronbach's alpha was .87–.90 in a previous study [16], Cronbach's α was .71–.81 in this study.

Instrument translation

The Korean translation of the SC-CHDI v3 followed the methodology recommended by the World Health Organization [18]. Authorization for the psychometric evaluation of the SC-CHDI v3 was acquired from its developer, Barbara Riegel. Initially, the translation was carried out by two bilingual nursing professors fluent in both Korean and English, who are knowledgeable about the cultural nuances between Korea and the United States two bilingual nursing professors, proficient in both Korean and English and knowledgeable about the cultural nuances between Korea and the United States, independently translated the instrument into Korean. Subsequently, another pair of independent nursing professors synthesized these translations. During this phase, they scrutinized the translation for accuracy and cultural appropriateness, making necessary adjustments to ensure the Korean version was coherent and culturally relevant.

Then, two separate bilingual translators independently conducted a back-translation of the Korean version into English. The back-translated versions were merged into one unified English document and scrutinized alongside the original instrument to detect and correct any language discrepancies or interpretation errors. This revised version was submitted to the instrument's developer, Barbara Riegel, for a final review, ensuring the translated SC-CHDI v3 accurately reflected the original's intent and meaning. The final version underwent a pilot test to assess the clarity and applicability of the instructions and items of the Korean version of the SC-CHDI v3 within the Korean cultural context. Ten patients with CHD who had not previously been exposed to the instrument were recruited through a convenience sampling procedure. Participants were instructed to complete the Korean version of the SC-CHDI v3 and were requested to identify any ambiguous or unacceptable terms or expressions and suggest possible alternatives. Following the pilot test, two patients responded that it was unnatural to use “my” in Korean in items 10 to 16 and corrected it. Given that all participants in this pilot test confirmed that the instrument was easy to understand and straightforward, the Korean version of the SC-CHDI v3 was finalized.

Data collection

Data were collected in the cardiology outpatient clinic from May 3 to August 22, 2022. Patients visiting the outpatient cardiovascular clinic were enrolled in the study. Research assistants screened and identified potential participants who met the inclusion criteria based on their medical records. They approached eligible patients individually and provided pertinent information, including the study's purpose, procedure, benefits, risks, and the required participation time. They also informed participants of their rights, including confidentiality and withdrawal rights. Written consent was obtained from those who voluntarily agreed to participate. Participants then completed the self-report questionnaires and answered questions about sociodemographic and clinical characteristics. The survey took approximately 15 to 30 minutes.

Data analysis

The collected data were analyzed using IBM SPSS Statistics version 26, AMOS version 25 (IBM Corp., Armonk, NY, USA), and the R program. Descriptive statistics conducted with SPSS were used to analyze the sociodemographic and clinical characteristics of the participants and the Korean version of the SC-CHDI v3.

Construct validity

The sample was divided into two subsamples using the random assignment function in SPSS to validate construct validity. This ensured that each subsample met the necessary sample size criteria: at least 10 times the number of items for exploratory factor analysis (EFA), with 237 cases, and a minimum of 200 cases for confirmatory factor analysis (CFA), with 215 cases [19].

Subsample 1 ($n = 237$) underwent EFA to explore the Korean version of the SC-CHDI v3 structure. Given that the instrument was initially developed for CHD patients in the United States, it was crucial to consider how Korean patients' sociodemographic characteristics and cultural context might affect the instrument's construct. Therefore, we employed an EFA to ascertain whether the construct aligns with that of the original instrument or if novel factors emerge. The Kaiser–Meyer–Olkin (KMO) measure and Bartlett's test of sphericity were utilized to determine the data's appropriateness for factor analysis, demonstrating suitability with a KMO value of .50 or higher and a significant Bartlett's test outcome ($p < .05$) [20]. Factor analysis with Promax rotation was applied for factor extraction and items with factor loadings < .30 were considered for deletion to refine the instrument [21].

Subsample 2 ($n = 215$) was used in CFA to test the suitability of the measurement model identified through EFA. Given that the CFA test data did not meet the criteria for multivariate normality, the bootstrap method was employed as an alternative approach [22]. In evaluating the fit of the model, an array of goodness-of-fit measures and benchmarks were applied: a chi-square test (χ^2) showing a value that was not statistically significant ($p > .05$), a comparative fit index (CFI) exceeding .95, a root mean square error of approximation (RMSEA) below .06, a Tucker-Lewis index (TLI) greater than .90, and a standardized root mean square residual (SRMR) at or below .06 [23,24]. To improve the model's fit, covariance was adjusted for items with a modification index (MI) of 10 or higher [25]. A previous study [12] found that factor loadings were deemed adequate if greater than | .30 | [26]. EFA and CFA were conducted using the AMOS program.

Concurrent validity

To assess concurrent validity, correlations were evaluated between the self-care maintenance, monitoring, and management domains of the Korean versions of the SC-CHDI v3 and Cardiac Self-Efficacy Scale based on previous research [12,27,28]. The hypothesis was raised based on prior studies that reported self-efficacy influencing promoting self-care [12,27,28]. Pearson correlation coefficient was used to test the concurrent validity, where values from .1 to .3 indicated low correlations, .3 to .5 indicated medium correlations, and values above .5 indicated high correlations. Pearson correlation coefficients were calculated using the SPSS program.

Internal consistency

Internal consistency was calculated using Cronbach's alpha for unidimensional scale and McDonald's omega coefficients for multidimensional scales (i.e., when more than one latent factor explains the correlations among the items) [29]. McDonald's omega coefficients offer a more comprehensive reliability estimate as they do not assume essential tau-equivalence [30]. Values exceeding .7 are deemed to represent a satisfactory degree of internal consistency [29,30]. Calculations of reliability coefficients were performed utilizing the R program.

Ethical considerations

The institutional review board at the hospital where the data of this study were collected ethical approval for this study (*Approval no.* AJOUIRB-SUR-2022-100). This study was conducted according to the principles of the Declaration of Helsinki; before initiating

data gathering, participants were briefed on the study's objectives, the processes, the anticipated advantages, and possible hazards, and their freedom to exit the study whenever they chose. Anonymity and confidentiality were assured. The questionnaire was administered only to those who provided written consent, and completed questionnaires were immediately collected in sealed envelopes by an experienced research assistant.

Results

Participants' sociodemographic and clinical characteristics

The mean age of participants was 64.59 years (SD = 9.63). They were predominantly men (n = 372, 82.3%), married (n = 363, 80.3%), and employed (n = 281, 62.2%). The participants' mean number of comorbid conditions was 2.96 (SD = 2.06). The mean duration of illness was approximately 4.00 years (SD = 5.40) (Table 1).

Construct validity

Self-care maintenance subscale

The results demonstrated a KMO value of .67 and Bartlett's test of sphericity value of χ^2 = 345.85 (p < .001), meeting the prerequisites for factor analysis. In EFA, two factors were identified with two out of nine items (items 6 and 9) demonstrating factor loadings of < .30. Therefore, EFA was rerun excluding these items, and two factors were identified (Factor 1 "treatment adherence" and Factor 2 "health-promoting behaviors"). All seven items exhibited factor loadings ≥ .30. In the CFA, the indices for model fit were deemed adequate after corrections were made for covariance errors, except the χ^2 statistic: χ^2 = 18.19 (df = 12, p = .110), CFI = .97, RMSEA = .05, TLI = .95, and SRMR = .04 (Table 2). All factor loadings were significant and adequate, and the two factors showed a positive and significant correlation of .65 (p < .001), as indicated in Figure 1.

Table 1 *Sociodemographic and Clinical Characteristics of Participants (N = 452).*

Characteristics	Total (N = 452)	Subsample 1 (n = 237)	Subsample 2 (n = 215)
	n (%) or Mean ± SD	n (%) or Mean ± SD	n (%) or Mean ± SD
Age, year (range: 40–79)	64.59 ± 9.63	64.41 ± 9.74	64.78 ± 9.51
≤54	67 (14.8)	33 (13.9)	34 (15.8)
55–64	163 (36.1)	86 (36.3)	77 (35.8)
≥65	222 (49.1)	118 (49.8)	104 (48.4)
Gender			
Men	372 (82.3)	195 (82.3)	177 (82.3)
Women	80 (17.7)	42 (17.7)	38 (17.7)
Marital status			
Unmarried	89 (19.7)	43 (18.1)	46 (21.4)
Married	363 (80.3)	194 (81.9)	169 (78.6)
Employment status			
No	171 (37.8)	86 (36.3)	85 (39.5)
Yes	281 (62.2)	151 (63.7)	130 (60.5)
Educational level			
≤Middle school	112 (24.8)	57 (24.1)	55 (25.6)
High school	155 (34.3)	73 (30.8)	82 (38.1)
≥University	185 (40.9)	107 (45.1)	78 (36.3)
Body mass index, kg/m^2 (range: 17.69–40.43)	25.10 ± 3.11	25.10 ± 3.23	25.11 ± 2.98
<23.0	98 (21.7)	48 (20.2)	50 (23.2)
23.0~25.0	136 (30.1)	80 (33.8)	56 (26.1)
≥25.0	218 (48.2)	109 (46.0)	109 (50.7)
Currently smoking			
Yes	71 (15.7)	43 (18.1)	28 (13.0)
No	381 (84.3)	194 (81.9)	187 (87.0)
Number of comorbid conditions (range: 0–7)	2.96 ± 2.06	2.78 ± 2.06	3.16 ± 2.05
Illness duration, year (range: 0.25–17.42)	4.00 ± 5.40	3.73 ± 5.27	4.29 ± 5.54
<5	308 (68.1)	168 (70.9)	140 (65.1)
5~10	75 (16.6)	37 (15.6)	38 (17.7)
≥10	69 (15.3)	32 (13.5)	37 (17.2)

Self-care monitoring subscale

The KMO measure was .80, and Bartlett's test of sphericity was 1240.05 (p <.001), confirming the suitability of the data for factor analysis. EFA identified one factor ("monitoring behaviors"). All seven items displayed factor loadings of ≥ .30. In the CFA, the indices for model fit were deemed adequate after corrections were made for covariance errors, except the χ^2 statistic: χ^2 = 19.19 (df = 11, p = .059), CFI = .99, RMSEA = .06, TLI = .99, and SRMR = .04 (Table 2). All factor loadings in the modified model were significant and adequate (Figure 2).

Self-care management subscale

The KMO measure was .78, and Bartlett's test of sphericity was 716.38 (p < .001), confirming the suitability of the data for factor analysis. EFA identified two factors (Factor 1, "consulting behaviors," and Factor 2, "problem-solving behaviors"). All six items showed factor loadings of ≥ .60. In CFA, the model-fit indices were sufficient except for RMSEA: χ^2 = 16.44 (df = 8, p = .037), CFI = .99, RMSEA = .07, TLI = .98, and SRMR = .03 (Table 2). All factor loadings were found to be significant and adequate, and the two factors indicated a positive and significant correlation of .61 (p < .001) (Figure 3).

Concurrent validity

The Pearson correlation coefficients were analyzed to examine the relationship between the Cardiac Self-Efficacy Scale scores and the Korean version of the SC-CHDI v3 self-care maintenance, monitoring, and management scores. The total self-efficacy scores demonstrated a positive correlation with self-care maintenance (r = .18, p < .001), monitoring (r = .33, p < .001), and management (r = .04, p = .413) scores, respectively.

Internal consistency reliability

The internal consistency reliability analysis revealed that McDonald's omega for the self-care maintenance and management subscales, which have two dimensions, was .53 and .86, respectively. Cronbach's alpha for the self-care monitoring subscale, which has one dimension, was .85.

Discussion

We performed EFA and CFA to test the construct validity of the Korean version of the SC-CHDI v3. In the EFA of the self-care maintenance subscale, we observed low factor loading values for item 6 ("ask for low-fat items when eating out or visiting others") and item 9 ("avoid cigarettes and smokers"). Consequently, we excluded these two items due to their limited contribution to the self-care maintenance subscale. We attributed the low factor loading of item 6 to the relatively sparse availability of special diet menus, such as low-fat options, in Korean restaurants despite the increasing prevalence of Western-style Korean eating-out culture [31]. Additionally, requesting a special diet when visiting someone else's home is often considered impolite in Korean culture, which may have influenced the factor loading of item 6. Moreover, with the changed perception about cigarettes and smoking being allowed only in restricted areas, an increasing number of people are avoiding these in Korea. In this study, almost half of the

Table 2 *Fit Index Values for the Korean Version of the Self-Care of Coronary Heart Disease Inventory Version 3 (N = 215).*

Korean version of the SC-CHDI v3	Model	χ^2 test goodness of fit			CFI	RMSEA	TLI	SRMR
		χ^2	df	*p*				
Self-care maintenance	Before adjust model	36.13	13	<.001	.90	.09	.83	.08
	After adjust model	18.19	12	.110	.97	.05	.95	.04
Self-care monitoring	Before adjust model	187.34	14	<.001	.85	.24	.77	.08
	After adjust model	19.19	11	.059	.99	.06	.99	.04
Self-care management	Before adjust model	16.44	8	.037	.99	.07	.98	.03

Abbreviations: CFI, comparative fit index; RMSEA, root mean square error of approximation; SC-CHDI, Self-Care of Coronary Heart Disease Inventory; SRMR, standardized root mean square residual; TLI, Tucker–Lewis index.

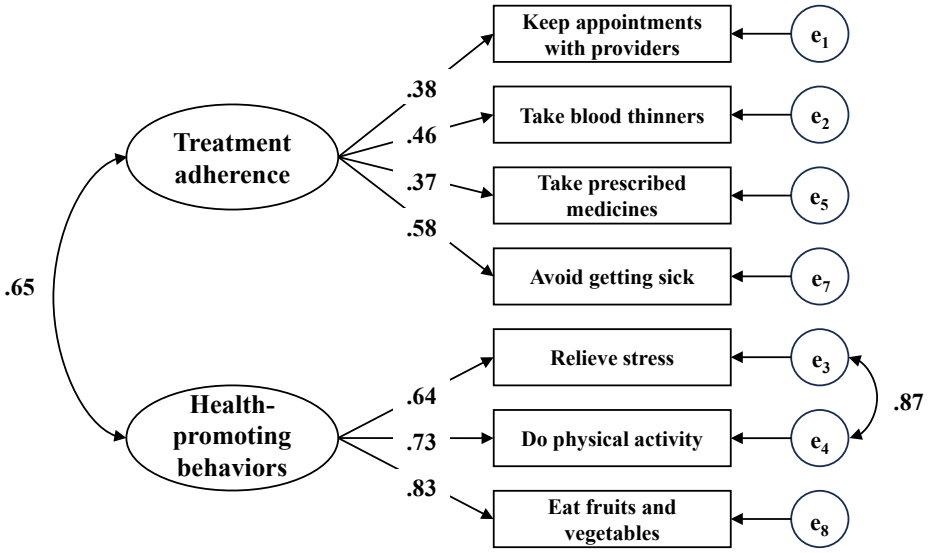

Figure 1. Confirmatory factor analysis of the self-care maintenance subscale.

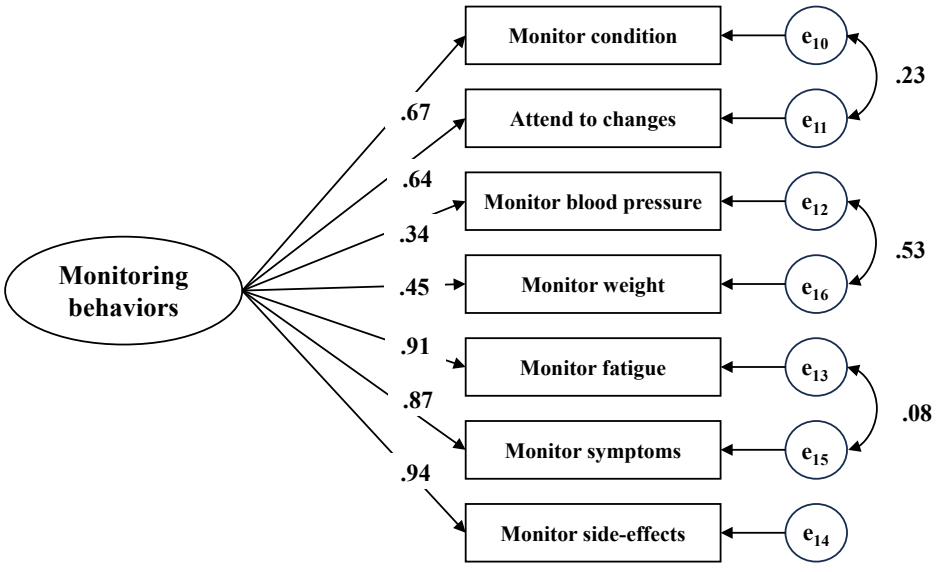

Figure 2. Confirmatory factor analysis of the self-care monitoring subscale.

participants consistently responded “always or daily” to item 9. In contrast, the other half responded “never or rarely,” demonstrating a trend of skewed responses to one extreme or the other. This may be related to the low factor loading value of item 9 for the corresponding scale. Overall, our study underscores the importance of cultural considerations in the evaluation and refinement of self-care assessment tools for specific populations like Korean patients with CHD.

After excluding items 6 and 9 and adjusting for the error of covariance, the two-factor structure of the seven-item self-care

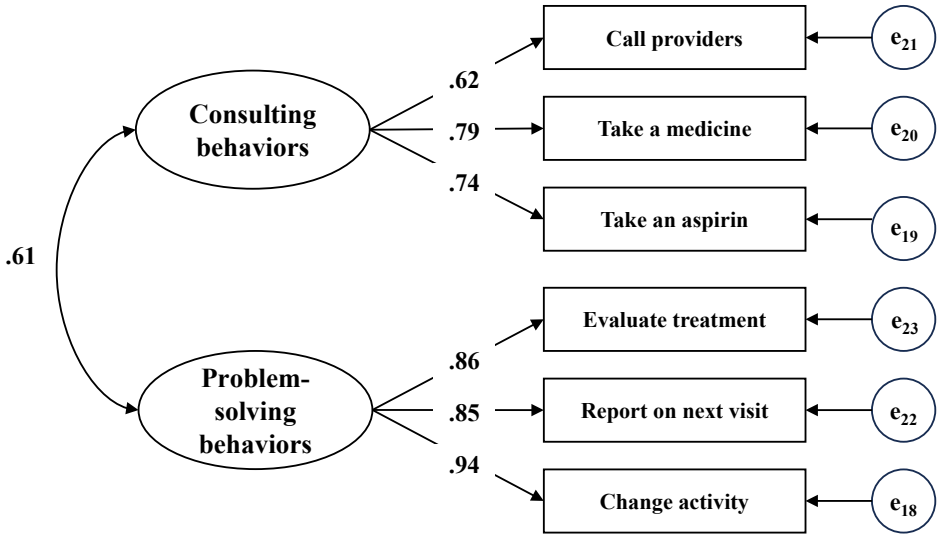

Figure 3. Confirmatory factor analysis of the self-care management subscale.

maintenance subscale showed satisfactory fit statistics: "treatment adherence" and "health-promoting behaviors." However, the two-factor model differed somewhat from those reported in previous studies [12,13]. In previous studies [12,13], item 7 ("avoiding getting sick") was allocated to the factor "health-promoting behaviors." However, in this study, it was included in the factor "treatment adherence." These differences could be ascribed to the study being undertaken during the period of the COVID-19 pandemic. During this period, patients with chronic diseases such as CHD and heart failure received recommendations to minimize the risk of virus transmission and disease exposure, including vaccination and mask-wearing. Additionally, considering that the Middle Range Theory of Self-Care of Chronic Illness encompasses adherence to medical service provider recommendations (e.g., healthy diet and regular exercise) and medical prescriptions (e.g., drug therapy and regular outpatient visits) under self-care maintenance, the item "avoiding getting sick" might be more appropriately categorized under "treatment adherence" [10,14].

EFA conducted on the self-care monitoring subscale revealed that seven items were loaded onto a single factor: monitoring behaviors. The CFA demonstrated that all values met the cutoff criteria after corrections were made for covariance errors, affirming that all seven self-care monitoring items are classified under a single factor. These findings align with the results observed in SC-CHDI v3 validation studies conducted in Italy [12] and Thailand [13] regarding patients with CHD. The factor "monitoring behaviors" encompassed seven items related to objective self-care monitoring behaviors (e.g., checking blood pressure, monitoring drug adverse effects) and subjective self-care monitoring behaviors (e.g., paying attention to mood swings, checking for fatigue). Therefore, the self-care monitoring subscale aids patients with CHD in attentively monitoring their regular health status and sensitively identifying changes [4,13], ultimately facilitating the improvement of self-care maintenance practices.

Finally, the EFA of the self-care management subscale revealed that six items were loaded into two factors: "consulting behaviors" and "problem-solving behaviors." In CFA, all goodness-of-fit indices met the cutoff criteria. In this study, "consulting behaviors" encompassed items requiring the active involvement of medical service providers, such as items 19 ("taking an aspirin"), 21 ("calling providers"), and 20 ("taking medication"). Conversely, "problem-solving behaviors" comprised items related to longer-term self-care. Including items about medication or guidance from medical service providers in the "consulting behaviors" factor diverged from the results of a previous study, where items 21 and 22 were loaded differently [12]. However, these findings align with those observed in SC-CHDI v3 validation studies conducted in Thailand [13] or China [14] regarding patients with CHD. This consistency could be attributed to the increasing recognition of the significance of self-medication as an initial response to symptoms such as chest pain, burning, and shortness of breath among patients with CHD [32]. Meanwhile, all six items exhibited adequate factor loading with values $\geq$ .60.

Its correlation coefficient with the Cardiac Self-Efficacy Scale was analyzed to evaluate the concurrent validity of the Korean version of SC-CHDI v3. The study revealed that the self-care maintenance and monitoring scores had weak correlations with Cardiac Self-Efficacy Scale scores. These are consistent with previous studies that indicate weak correlations between these measures [12]. Moreover, in contrast to prior research suggesting a moderate correlation between self-care management score and Cardiac Self-Efficacy Scale score [12], this study failed to demonstrate a statistical relationship between these measures. This may be linked to the culture of Eastern healthcare systems, which tends to limit patients' autonomy in self-care decisions or the efficacy of self-care, such as managing prescribed medications or activities when symptoms appear [14]. However, considering that patients with high self-efficacy in coping with their chronic diseases reflect a perceived ability to manage challenges related to their diseases [33]. Efforts to increase self-efficacy for self-care will be essential.

The internal consistency reliability of the SC-CHDI v3 subscales was analyzed using Cronbach's alpha (α) and McDonald's omega (ω) coefficients. Cronbach's alpha, a widely utilized measure for determining internal consistency, relies on stringent prerequisites such as one-dimensionality, the independence of error terms, and essential tau-equivalence across test items. Violating these conditions could lead α coefficients to inaccurately gauge the absolute reliability, either by overestimating or underestimating it [30]. Meanwhile, ω coefficients offer a more comprehensive reliability estimate as they do not assume essential tau-equivalence [30]. Therefore, α was deployed to gauge the unidimensional construct of self-care monitoring. In contrast, Ω was applied to assess this study's multidimensional self-care maintenance and management

constructs. The results revealed that self-care maintenance exhibited low reliability with a ω of .53. Simultaneously, other subscales maintained internal reliability with a α or ω ≥ .70. The low reliability of the self-care maintenance subscale could potentially be related to the reduction in the number of items compared to the original instrument by removing two items that showed minimal contribution during construct validity testing. However, since this study is the first to use the Korean version of SC-CHDI v3, it is necessary to secure evidence to verify the instrument's reliability through repeated studies.

The strengths of this study are as follows: First, it is significant as the first study to employ a systematic approach to test the validity and reliability of the Korean version of the SC-CHDI v3 among CHD patients. Second, this study's findings contribute to examining the impact of a self-management intervention for patients with CHD by developing a validated and reliable instrument [8]. Third, its utility extends to facilitating research on personalized interventions for improving self-care and assessing the effectiveness of self-care programs.

However, this study has some limitations, and future research directions are recommended. Caution is warranted when interpreting the findings, given that the survey solely included CHD patients from a single institution. Remarkably, replicating studies with more diverse demographics is essential, considering the sample's predominance of male and married individuals. Additionally, while this study investigated the three subscales in the structure of the SC-CHDI v3 and utilized Cronbach's alpha and McDonald's omega values for internal consistency reliability analysis, the inability to conduct test-retest reliability assessments due to study period limitations is acknowledged. Hence, follow-up research assessing the stability of the instrument is recommended. Furthermore, as the participants were exclusively patients with CHD receiving outpatient care at a tertiary hospital within a specific region, it is advised to conduct replication studies involving patients from various healthcare institution levels and expanded geographical areas to enhance the clinical applicability of the Korean version of the SC-CHDI v3.

Conclusions

In the present study, the SC-CHDI v3, three subscales devised based on the Middle Range Theory of Self-Care of Chronic Illness and extensively used globally to assess self-care, was systematically translated into Korean, and its applicability for Korean patients with CHD was scrutinized. The results revealed that the Korean version of SC-CHDI v3 comprises 21 items across three subscales: self-care maintenance, self-care monitoring, and self-care management. Each item on the three subscales is scored on a 5-point Likert scale, with higher scores indicating better self-care.

Furthermore, the outcomes substantiated the construct and criterion validity of the Korean version, while its reliability was also affirmed. Hence, with the Korean version of the SC-CHDI v3 being validated as an effective tool for gauging self-care levels in individuals with CHD, this study's results hold significant implications for clinical practice. They could guide the creation and assessment of intervention strategies to enhance self-care behaviors among Korean CHD patients.

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Ethics approval and consent to participate

The present study was approved by the institutional review board of the authors' affiliated university hospital (IRB no. AJOUIRB-SUR-2022-100). Informed consent was obtained from all participants before their participation in this study.

Consent for publication

As part of the informed consent process, permission was sought from the participants to be able to use the data collection in publication, with the participants remaining anonymous.

Availability of data and materials

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

Conflict of interest

All authors declare that they have no conflict of interests related to submitted manuscript.

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