


## Psychometric evaluation of the Farsi version of the Self-Care of Heart Failure Index (F-SCHFI v7.2)

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### Abstract

**Background:** Self-care is a fundamental principle in the treatment of heart failure because it can improve quality of life, reduce hospitalizations, and minimize the negative effects of the disease.

**Objectives:** This study aimed to evaluate the psychometric properties of the Farsi version of the Heart Failure Self-Care Index (F-SCHFI).

**Methods:** This cross-sectional study included 420 patients referred to the Rajaie Cardiovascular Medicine and Research Center in Tehran. The translation process followed the designer-approved forward-backward method. An exploratory factorial analysis was performed on a sample of 210 patients using the maximum likelihood method and Promax rotation. Confirmatory factor analysis was performed on an additional sample of 210 heart failure patients. Reliability was assessed by assessing internal consistency and composite reliability.

**Results:** The study included 420 patients with a mean age of  $54.37 \pm 19.48$  years. In the exploratory factor analysis, three factors—self-care management, symptom perception, and self-care maintenance—were extracted. These factors accounted for 41.15% of the total variance. The reliability of these factors was above 0.7. Confirmatory factor analysis showed that the final model had a good fit.

**Conclusion:** The results of this study show that the F-SCHFI has good validity and reliability in patients with heart failure, making it suitable for use in various research studies.

**Keywords:** Self care, Heart failure, Psychometric, Factor analysis.

### Introduction

Cardiovascular disease (CVD) is the leading cause of death worldwide, with heart disease being the leading cause of death in people over 65 years of age.<sup>1</sup> Heart failure is a common chronic disease among older adults, and despite advances in medical treatment, its prevalence and mortality rates continue to increase.<sup>2,3</sup> In 2008, the United States had approximately 6 million heart failure patients, or 2.4 percent of the country's population.<sup>1</sup> Similarly, between 1987 and 2003, approximately 2% of the

European population suffered from heart failure.<sup>4</sup> The disease has a high mortality rate, with approximately 40% of patients dying within the first year and 50% within the first four years.<sup>5</sup> Self-care plays a critical role in managing heart failure and improving patient outcomes.<sup>5</sup> Self-care involves naturalistic decision-making in which patients choose behaviors such as symptom monitoring and adherence to treatment regimens to maintain physiological stability and respond to disease symptoms.<sup>6</sup> In the context of heart failure, self-care

includes adherence to treatment, following a low-salt diet, limiting alcohol consumption, engaging in physical activity, avoiding smoking, daily monitoring of weight, and recognition of signs and symptoms of an exacerbation of the disease.<sup>1,7</sup> Despite the proven benefits of self-care behaviors in improving patients' quality of life and reducing hospital admissions, some patients find it difficult and reluctant to adopt these behaviors.<sup>8</sup> Measuring self-care is a complex task, often requiring researchers to assess patients' adherence to treatment or knowledge and to interpret and report the results as self-care behaviors.<sup>9-11</sup> Therefore, developing a valid and reliable scale would allow researchers to directly measure the concept of self-care without relying on other indicators. Previous self-care scales in the context of heart failure lacked validity or reliability or focused exclusively on specific aspects of self-care, such as self-care management.<sup>12, 13</sup>

## Objectives

The Heart Failure Self-Care Index (SCHFI) is a validated scale established by Riegel et al. (2019) to assess self-care behavior. The aim of this study is to evaluate the validity and reliability of the Farsi version of the SCHFI, version 7.2.

## Methods

### Study and setting

This cross-sectional study aimed to evaluate the psychometric properties of the Farsi version of SCHFI v7.2 in heart failure patients attending the Rajaie Cardiovascular Medicine and Research Center in Tehran in 2021.

### Sample size

Based on expert advice to suggest 5–10 samples per questionnaire item for exploratory factor analysis 14–16, a sample of 210 participants was selected for this study considering all 29 scale items. The inclusion criteria were communication skills, stable hemodynamic status, and willingness to participate. Incomplete questionnaires were excluded from the analysis.

### Scale

The original version of the scale (SCHFI v.4) included 15 items and three subscales: self-care maintenance, self-care management, and self-care self-confidence. Although the third subscale was not considered part of self-care behavior, it was included as an important predictor of self-care in this scale.<sup>17</sup> The scale was developed based on the situation-specific theory of self-care in heart failure. SCHFI v6.2, with 22 items, was released in 2009 to highlight the importance of symptom perception in the self-management process of patients with heart failure.<sup>18</sup> The current version of the scale, SCHFI version 7.2, was developed in 2016.<sup>19</sup> The Farsi-translated version, as well as translations into other languages, are freely accessible on the website [www.self-care-measures.com](http://www.self-care-measures.com).

### The translation processes

Once the scale developer received permission to translate and perform the psychometric assessment, the translation was performed using the back-and-forth method.<sup>20</sup> Initially, two independent translators translated the original English version into Farsi. The research team then investigated the Farsi version, resulting in a compiled version. Two other translators later translated the Farsi version back into English. The forward and reverse versions were sent to the scale designer for review.

### Face and content validity

To evaluate face validity, the Farsi version of SCHFI was administered to 10 heart failure patients selected via convenience sampling. After a thorough review, participants were asked to identify any ambiguous items and suggest alternative phrases. To test content validity, five experts, including a psychologist, a nurse, a health promotion specialist, and two cardiologists, reviewed the Farsi version of the SCHFI and provided feedback on its content.

### Construct validity and reliability

To assess the construct validity of the Farsi version of SCHFI, exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) were performed. The dataset, consisting of 420 participants, was randomly divided into two parts for analysis. EFA was performed on half of the data with SPSS (version 26.0, SPSS Inc., Chicago, IL, USA) using the maximum likelihood method

and Promax rotation. The suitability of the data for EFA was assessed by examining the results of the Kaiser-Meyer-Olkin (KMO) and Bartlett's tests of sphericity. An EFA can be performed if the KMO is  $> 0.8$  and Bartlett's test of sphericity is significant ( $p < 0.05$ ). The factor structure of the Farsi version of SCHFI was determined using parallel analysis and ensured that the communalities were greater than 0.2.

Additionally, the factor loadings for each item of the extracted factors had to exceed 0.3. CFA was then performed on the other half of the data using AMOS software version 26 to validate the factor structure derived from EFA. Model fit was assessed using several fit indices, including the Chi-square ( $\chi^2$ ) test, Chi-square ( $\chi^2$ )/degree of freedom (df) ratio  $< 4$ , Goodness-of-Fit Index (GFI)  $> 0.9$ , Comparative Fit Index (CFI)  $> 0.9$ , Normed Fit Index (NFI)  $> 0.9$ , Relative Fit Index (RFI)  $> 0.9$ , Incremental Fit Index (IFI)  $> 0.9$ , Tucker-Lewis Index (TLI)  $> 0.9$ , Standardized Root Mean Square Residual (SRMR)  $< 0.09$ , and Root Mean Square Error of Approximation (RMSEA)  $< 0.08$ .

The convergent validity and discriminant validity of the Farsi version of the SCHFI were also assessed. Convergent validity was assessed by examining whether the composite reliability (CR) was greater than 0.7 and the average variance extracted (AVE) was greater than 0.5. Construct reliability was assessed using internal consistency measures including Cronbach's alpha, McDonald's omega, CR, and maximum reliability (MaxR), with values greater than 0.7 indicating acceptable construct reliability.

### Multivariate Normality and Outliers

The study assessed the univariate and multivariate normality of the data. Univariate distributions were tested for outliers, skewness, and kurtosis. Multivariate normality was assessed using Mardia's multivariate kurtosis coefficient and Mardia's coefficient. A Mardia coefficient greater than 7.98 indicates a departure from multivariate normality. Outliers in the multivariate data were identified using the Mahalanobis distance ( $p < 0.001$ ).

### Ethical considerations

The study was conducted in accordance with the Declaration of Helsinki. In accordance with research

ethics standards, the objectives of the study were explained to the research participants, and their written informed consent to participate in the study was obtained. During the research, they were assured that the information contained in the questionnaires would remain confidential. This study is the result of the project approved by the Rajaie Cardiovascular Medical and Research Center (IR.RHC.REC.1399.123).

## Results

The study included 420 heart failure patients, consisting of 176 women and 244 men, with a mean age of 54.37 years (SD = 19.48). Most patients were over 60 years old, married, had primary and secondary education, and were employed. Further details can be found in Table 1.

**Table 1.** The demographic data of participants (n=420)

Variable	Frequency	Percentage
<b>Gender</b>		
Male	244	58.1
Female	176	41.9
<b>Age</b>		
Less than 40	122	29
41-60	129	30.7
More than 60	169	40.3
<b>Marital status</b>		
Single	74	17.6
Married	338	80.5
Widow	8	1.9
<b>Educational level</b>		
Illiterate	52	12.4
Primary & secondary	156	37.1
High school	94	22.4
Academic	118	28.1
<b>Occupation</b>		
Employed	138	32.9
Unemployed	195	46.4
Lack of information	87	20.7

### Face and content validity

No changes were made to the items in terms of face validity, as they were simple and clear. However, based on expert recommendations on content validity, two articles underwent minor changes while retaining the original content.

**Construct validity**

The results of EFA with Promax rotation (n=210) on the Farsi version of SCHFI are presented in Table 2. The analysis revealed a KMO of 0.893, indicating that the data was suitable for conducting factor analyses. Additionally, Bartlett's test of sphericity was found to be significant (p<0.001, 3910.445, df=210), thus confirming the adequacy of the data. Three factors were extracted, consisting of 17 items, which together represent 41.15% of the total variance. The first factor, called "self-care management," included six items related to activities such as seeking guidance, limiting daily activities to improve physical condition, identifying the cause of symptoms, taking medications, feeling better, and reducing intake of liquids. This factor explains 18.41% of the total variance, with Cronbach's alpha and MacDonald's omega

coefficients of 0.801 and 0.806, respectively.

Subsequently, a maximum likelihood CFA was performed (n=210) to validate the factorial structure obtained from the EFA. Figure 1 illustrates how five pairs of measurement errors (e1 to e6, e2 to e3, e7 to e9, e13 to e14, and e14 to e16) were freely allowed to co-vary to improve the model. The final three-factor model fit the data well after checking for modification indices in the first CFA: ( $\chi^2(96)=150.016$ , p<0.001,  $\chi^2/df=1.562$ , GFI=0.915, CFI=0.910, IFI=0.910, RMSEA (90% CI)=0.069 [0.066, 0.079]).

From Table 3, MSV was higher than AVE for the first and second factors. Thus, the fit indices and second-order CFA analysis revealed a second-order CFA fit:  $2(97)=153.11$ , p0.001,  $2/df=1.578$ , GFI=0.913, CFI=0.911, IFI=0.910, RMSEA=0.070 (90% CI: 0.066, 0.076) (Table 3, Figure 2).

**Table 2.** The result of EFA and internal consistency on the three factors Farsi version of SCHFI (n=210)

Factor	Items	Factor loading	h <sup>2</sup>	λ	% Variance	Internal consistency
Self-care management	26. Ask your family members and friends for guidance?	0.859	0.218	3.131	18.41	α= 0.801 Ω= 0.806
	28. Limit your activity until you feel better?	0.852	0.327			
	27. Try to recognize why you have the symptom?	0.730	0.447			
	24. Take a medication?	0.680	0.612			
	29. Did you feel better as a result of the method you used?	0.649	0.375			
	23. Reduce your fluid intake?	0.501	0.327			
Self-care maintenance	8. Ask for low-salt food when eating at a family member or friend's house?	0.829	0.621	2.141	12.60	α= 0.788 Ω= 0.789
	4. Regularly visit your doctor for routine check-up?	0.762	0.341			
	3. Make your diet low-salt?	0.637	0.525			
	5. Take your prescribed medication without missing a dose?	0.599	0.489			
	9. Use a specific method to remember to take your medications?	0.330	0.555			
Symptom perception	16. Monitor for symptoms carefully?	0.669	0.568	1.725	10.14	α= 0.735 Ω= 0.739
	17. Check swelling in your ankles?	0.665	0.490			
	18. Pay attention to the shortness of breath when performing activities, such as bathing or dressing?	0.558	0.444			
	13. Pay attention to side-effects of medications?	0.432	0.323			
	15. Ask your doctor about how you feel?	0.421	0.569			
	1. Try not to get sick (e.g. by washing your hands)?	0.400	0.579			

Abbreviation: h<sup>2</sup>: Communalities, λ= Eigenvalues

**Table 3.** The indices of the convergent, discriminant validity in the first-order CFA model (n=210)

CFA	CR	AVE	MSV	MaxR(H)	CFA	CR	AVE	MSV	MaxR(H)
The first order	First factor	0.825	0.443	0.618	The second order	0.900	0.751	0.000	0.915
	Second factor	0.796	0.444	0.432					
	Third factor	0.796	0.443	0.618					

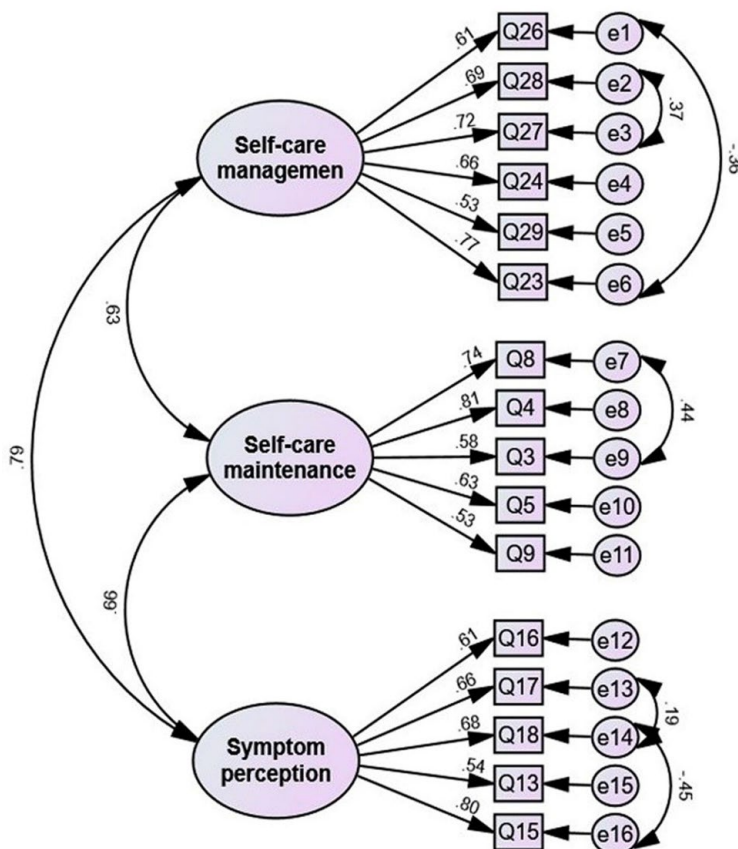


Figure 1. The First order CFA

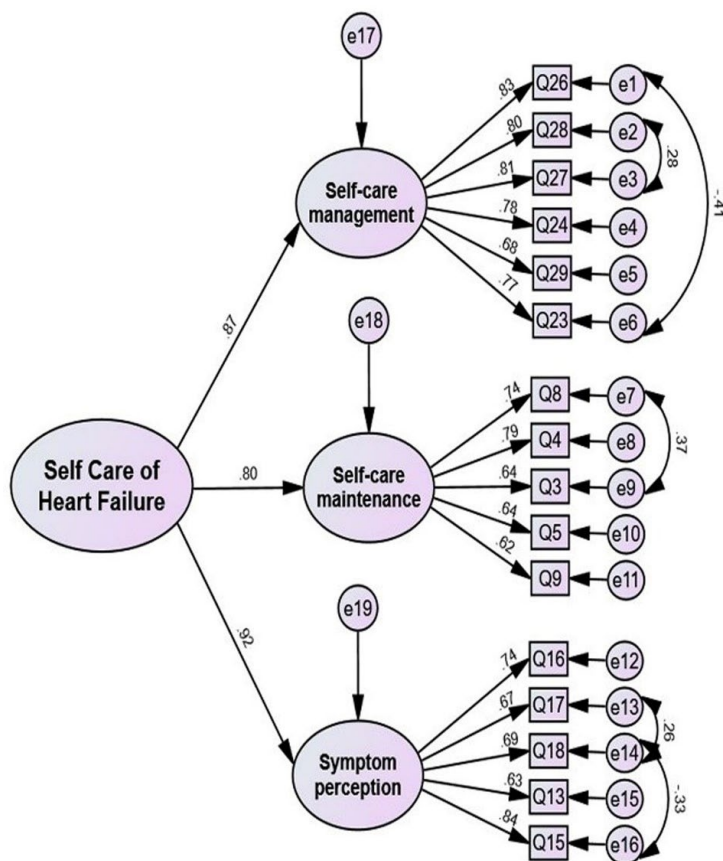


Figure 2. The Second order CFA



## Discussion

This study aimed to investigate the validity and reliability of the Farsi version of SCHFI v7.2. The previous version (SCHFI v6.2) has been translated into many international languages. Three factors consistent with the original version were extracted in the EFA, and the items on these factors were similar to the original version. Self-care management activities include seeking advice, limiting daily activities to improve physical condition, identifying the cause of symptoms, taking medications, feeling better, and reducing fluid intake.

Items # 26 (requesting advice) and # 28 (limiting daily activities to improve physical condition) had factor loadings greater than 0.8. It is important for patients to pay attention to the symptoms of the disease as part of their self-care and promptly recognize minor changes. Patients should be educated to be more aware of symptoms such as shortness of breath and weight gain.<sup>21</sup> Diagnosing the disease before it occurs is challenging, so little progress has been made in slowing the disease. Therapeutic interventions are generally limited to the period following diagnosis. Therefore, existing treatments have a limited impact on the disease process.<sup>22</sup>

Patients who underestimate the severity of their symptoms are more likely to seek help and misattribute symptoms to age or other underlying illnesses.<sup>23,24</sup> In the Farsi version, three items #21 (How quickly did you recognize that the symptom was due to heart failure?), #22 (Reduce salt in your diet that day?), and #25 (Contact your doctor for advice) were not included in any factor. The reason why items #21 and #22 were removed could be that the patients are illiterate or have poor health knowledge. Item #25 concerns how patients contact their doctors, which may not apply in Iranian society. Most patients do not have their doctor's contact information and instead go to the emergency room when they experience symptoms related to their illness.

The self-care maintenance factor includes several activities related to managing one's health, including asking for low-salt foods during social gatherings, visiting the doctor regularly, following a low-salt diet, consistently taking medications during meals, and implementing strategies to remember taking medications. In particular,

item # 8 showed a high factor loading of 0.8, indicating a strong association with the self-care maintenance factor. A low-salt diet, frequent doctor visits, asking for low-salt food at social events, taking medications consistently with meals, and using memory aids are just a few examples of the activities that make up the self-care maintenance factor.

Items #2, #6, #7, and #10 were not assigned to any factor. These items included exercising, ordering low-salt foods, getting the annual flu vaccination, and checking with the doctor about prescribed medications. The exclusion of Item #2 from any factor can be attributed to the poor physical condition of the patient. Additionally, Item #6, which talks about eating out, does not correspond to current economic challenges and inflationary concerns. Furthermore, Item #7 was related to the receipt of the influenza vaccine.

It is important to note that patients with heart failure are at increased risk of contracting the flu and its associated complications.<sup>25</sup> The American Heart Association/American College of Cardiology (AHA/ACC) recommends annual influenza vaccination as a secondary preventative measure for these patients.<sup>26</sup> However, due to financial difficulties, many Iranian patients do not receive the flu vaccine. Nevertheless, a meta-analysis showed that influenza vaccination is significantly associated with a reduced risk of all-cause mortality in patients with heart failure.<sup>27</sup>

Another study also demonstrated that frequent vaccination and early year-round immunization are associated with a more significant reduction in mortality risk than intermittent, late immunization.<sup>28</sup> However, Item #10, which concerns asking the doctor about prescribed medications, was not relevant to our patients for the following reasons: Inappropriate methods of visiting patients, such as having multiple patients in the examination room at the same time and conducting examinations and interviews in the presence of other patients (group visits), are considered violations of medical ethics because they endanger privacy and confidentiality. Therefore, due to feelings of shame and embarrassment, patients refrain from discussing critical issues related to their illness.<sup>29</sup> Results from another

qualitative study showed that most patients are dissatisfied with doctors who lack effective communication skills and do not pay attention to what patients have to say.<sup>30</sup>

The perception of symptoms was the third factor found. Items #11 (monitoring weight), #12 (paying attention to your changes), #14 (paying attention to fatigue), #19 (paying attention to disease symptoms), and #20 (diagnosis of disease symptoms) were not included in the Farsi version of this factor, in contrast to the original. It is crucial to take medication side effects into account because enduring them can result in treatment non-compliance or delays in taking medication.<sup>31,32</sup> Clark et al. have proposed the use of symptom diaries as a means of improving symptom monitoring for heart failure patients, drawing on the success of this approach in various healthcare fields such as psychiatry, obstetrics, and gynecology.<sup>23,33</sup> Additionally, nurses have incorporated diaries into patient education programs.<sup>34</sup> However, due to cultural differences, some items were excluded from the factors. Culture plays a significant role in shaping self-care practices, impacting how patients perceive, monitor, and articulate their symptoms.<sup>35</sup> However, certain cultural barriers, such as fatalism, collectivism, and adherence to traditional beliefs, were found to impede certain self-care behaviors among African American and Asian populations.<sup>36</sup> Notably, the observed reliability of these cultural factors was deemed satisfactory based on both Cronbach's alpha and McDonald's omega coefficients, and the confirmatory factor analysis (CFA) further validated the model derived from exploratory factor analysis (EFA).

A notable limitation of the study is that out of the 29 items included in the questionnaire, 12 were not associated with any established factor, possibly owing to the cultural disparities between the two societies. Therefore, to account for cultural nuances and ensure the questionnaire's appropriateness, it is recommended that researchers create a Farsi version of the self-care tool specific to Iranian culture.

## Conclusions

The results of this study indicated that the F-SCHF1 shows good validity and reliability in patients with heart failure, making it suitable for use in various studies.

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## Competing interests

The authors declare that they have no competing interests.

## Abbreviations

Average Variance Extracted: AVE; Confirmatory factor analysis: CFA; Comparative Fit Index: CFI; Composite Reliability: CR; Cardiovascular diseases: CVDs; Exploratory factor analysis: EFA; Farsi version of the Self-care of Heart Failure Index: F-SCHF1; Goodness-of-Fit Index: GFI; Incremental Fit Index: IFI; Kaiser–Meyer–Olkin: KMO; Maximum Reliability: MaxR; Normed Fit Index: NFI; Relative Fit Index: RFI; Root Mean Square Error of Approximation: RMSEA; Self-care of Heart Failure Index: SCHF1; Standardized Root Mean Square Residual: SRMR; Tucker–Lewis Index: TLI.

## Authors' contributions

FS and RGG: manuscript preparation and study conceptualization; NN, ST, MMP, AA, MM, and FN: data collection and manuscript preparation; RGG: study design; FS and RGG: final revision and grammar editing; HSN and AE: statistical analysis. All authors read and approved the final manuscript. All authors take responsibility for the integrity of the data and the accuracy of the data analysis.

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## Role of the funding source

None.

## Availability of data and materials

The data used in this study are available from the corresponding author on request.

## Ethics approval and consent to participate

According to the standards of ethics in research, the objectives of the study were explained to the research

participants, and their written informed consent was obtained to participate in the study. They were assured during the investigation that the information contained in the questionnaires would remain confidential. This study is the result of the project approved by the Rajaie Cardiovascular Medical and Research Center (IR.RHC.REC.1399.123).

### Consent for publication

By submitting this document, the authors declare their consent for the final accepted version of the manuscript to be considered for publication.

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