

maintenance, self-care management, and self-care confidence (19).

Study procedure

To translate the EHFScBS-9 questionnaire, first written consent was obtained from its developer, and then the Forward-Backward approach was used to translate. The original version of the tool was translated from English to Persian by two translators simultaneously. During the translation, an attempt was made not to change the meaning of the phrases. The Persian versions were then translated into English by two translators. The expert panel assesses the similarity of the two versions of the questionnaire in English.

Validity and reliability

In the next step, validity (face, content, construct, and criterion validity) and reliability (internal consistency and stability) tests were used for the psychometric evaluation of the questionnaire.

Face validity

Qualitative (10 patients with heart failure) and quantitative (10 faculty members) methods were used to determine the questionnaire's face validity. These participants were interviewed face-to-face, and the difficulty, relevancy, and ambiguity levels were assessed. Item impact approach was used to determine the quantitative face validity. The item impact score was calculated by multiplying the frequency in the form of a percentage (the number of people who scored 4 and 5 to each item) by the importance (mean score of importance based on the Likert scale). The acceptable item effect score for each item was equal to or greater than 1.5 (20).

Content validity

The qualitative content validity was determined by 12 experts, including professors in nursing and cardiologists interviewed regarding content coverage,

grammar compliance, appropriate expressions, and proper coherence of the content. Quantitative content validity was also determined based on 12 experts' opinions using content validity ratio (CVR) and content validity index (CVI). To calculate the content validity index, three criteria of simplicity and expressiveness, relevance, and clarity were used based on each item's four-Likert scale. It was then calculated using the following formula: dividing the number of experts in agreement with the items scored 3 and 4 by the total number of experts. If the score is above 0.79, then the items are considered appropriate; if the score is between 0.70 and 0.79, the items need revision; and if the score is below 0.70, then the items are considered unacceptable and will be eliminated (21). To calculate the content validity ratio (CVR), according to the experts, the items were categorized as the three spectra of "necessary", "useful, but not necessary", and "unnecessary" and were calculated using the following formula: $CVR = (ne - N / 2) / (N / 2)$ where *ne* refers to the number of experts who have chosen the term "necessary" and *N* refers to the total number of experts. According to Lawshe's table, the CVR coefficient of higher than 0.56 is considered acceptable (21). In addition, to calculate the scale content validity index (S-CVI) for the entire instrument, the average content validity index scores for all the items were calculated, and then the values of 0.9 or higher were considered acceptable (22).

Initial reliability

In a pilot study, initial reliability (internal consistency) was performed on 30 patients with heart failure.

Factor analysis

Factor analysis was used to determine to construct validity. Since there is no specific sample size estimation formula in factor analysis studies, 5-10 individuals were estimated per each item (23), and the total sample size should include more than 200 individuals (24). Therefore, due to the low

number of items (9 items) in this study, a sample size of 216 individuals was selected through consecutive sampling. Before sampling, all participants were informed about the aims of the study. Written informed consent was obtained after the samples were assured of confidentiality. The participants then completed questionnaires. Kaiser-Meyer-Olkin (KMO) sampling adequacy index was used, and the values of 0.60 were considered acceptable (25). Bartlett's test of sphericity was also used. Exploratory factor analysis was performed using extraction method principal analysis and Varimax rotation. The number of factors was determined based on the eigenvalues and the score plot. Each question's factor load in the factorial and rotated matrix was considered to be at least 0.4 (26).

Criterion validity

Convergent validity is the type of Criterion-related validity. Convergent validity was assessed by comparing the instrument's scores with scores of another instrument that assessed a similar construct (27). In this study, the Self-Care of Heart Failure Index v.6 was used as a criterion.

Reliability

Internal consistency and stability (test-retest) were used to estimate the ultimate

reliability of the questionnaire. Cronbach's alpha coefficient of 0.6 was considered as the cut-off point (28). Internal consistency was performed on 216 patients with heart failure. Test-retest was performed on 30 patients with heart failure with an approximately two-week interval, and interclass correlation coefficient (ICC) was calculated to determine the stability of the questionnaire. A minimum ICC value of 0.4 was considered acceptable (29).

The data were analyzed using version 24 of the SPSS software. Descriptive statistics (mean, standard deviation, and frequency) and inferential statistics (exploratory factor analysis, Cronbach's alpha, interclass correlation coefficient, and Pearson correlation coefficient) were also used. It should be noted that a P-value lower than 0.05 was considered as the level of significance.

Results

Socio-demographic and clinical status

Participants in this study included 216 patients with heart failure. The mean and standard deviation of patients' age was 59.83 ± 15.37 years. Most participants (59.3%) were female and had level 2 heart failure (46.3%). Other demographic information is listed in Table 1.

Table 1. Participants' Demographics (N=216)

Status	Patients	
	N (%)	
Gender	Male	88 (40.7)
	Female	128(59.3)
Marital status	Single	71(32.9)
	Married	145(67.1)
Education	Illiterate	65(30.1)
	Under diploma	81(37.5)
	Academic degree	70(32.4)
Level of heart failure	1	39(18.1)
	2	100(46.3)
	3	67(31)
	4	10(4.6)
Economic status	Weak	53(24.5)
	Medium	57(26.4)
	Good	106(49.1)

Validation

The qualitative face validity findings were indicative of difficulty level, quantity, and ambiguity of the scale and the 5-point Likert range recognized by the participants. All nine items were maintained based on the quantitative face validity results because the impact score was reported at higher than 1.5. The experts also confirmed the qualitative content validity; so, all the items remained unchanged. The EHFScBS scale was considered sufficiently comprehensive by the experts. The content validity ratio (CVR) and content validity index (CVI) was higher than 0.56 and 0.80 in all questionnaire items, respectively. The mean content validity index (S-CVI / Ave) score was 0.96, which is acceptable. Based on the initial reliability test results, the entire questionnaire's internal consistency was 0.966. The correlation

between each item's scores and the total questionnaire ranged from 0.875 to 0.898, which was confirmed.

Construct validity was assessed in a sample of 216 patients with heart failure. According to Bartlett's Test of Sphericity, there was a sufficient correlation between the variables for the factor analysis ($p \leq 0.001$, $X^2 = 210.854$, and $df = 36$). The result of the KMO test was 0.845, indicating the adequacy of the data for analysis. The results of the Scree plot and Eigenvalue tests showed a single factor is sufficient to explain the EHFScBS 9-item factor construct after examining the internal consistency of the instrument. Only one factor was extracted based on correlation matrix results. The factor load of all the items is given in Table 2.

Table 2. The factor load of the items

EHFScBS items	Factor load
I weigh myself every day	0.643
If shortness of breath increases, I contact my doctor or nurse	0.840
If legs/feet are more swollen, I contact my doctor or nurse	0.894
If I gain weight more than 2 kg in 7 days, I contact my doctor or nurse	0.840
I limit the number of fluids	0.772
If I experience fatigue, I contact my doctor or nurse	0.811
I eat a low-salt diet	0.884
I take my medication as prescribed	0.830
I exercise regularly	0.810

The criterion validity results showed that the correlation between the present questionnaire and the SCHFI v.6 questionnaire was positive and significant ($r = 0.753$, $P < 0.001$).

Reliability

Based on the reliability results, Cronbach's alpha coefficient of the questionnaire (0.78) was acceptable. Stability was assessed using the two-way mixed absolute agreement method, which ICC = 0.89 (95% CI: 0.743-0.957).

Discussion

In this study, face validity was evaluated and then approved both qualitatively and quantitatively. However, face validity was not reported in some similar studies (14, 16, 18); Jaarsma et al. (30) evaluated the qualitative validity of the EHFScBS-9 scale based on the experts' opinions.

In the present study, the qualitative face validity was assessed based on the opinions of experts (10 faculty members) and the opinions of 10 patients with heart failure. Mohammadbeigi et al. asserted that to determine the instrument's face validity, both quantitative and qualitative methods should be used. They further maintained that the

qualitative methods should be conducted regarding both experts and target groups (31), which is the case in the present study.

Moreover, in this study, content validity was also assessed both qualitatively and quantitatively. The S-CVI/Ave index was reported as 0.94 for the present questionnaire. Polit and Beck recommend a score of 0.9 and higher for the validity index to be considered acceptable (32); therefore, the content validity in the present study is high enough and confirmed. In line with the present study results, other similar studies (15, 17, 30) examining the content validity of the EHFSBS-9 scale also confirmed the content validity of this scale. It is noteworthy that content validity has not been reported in some other similar studies (14, 16, 18).

The present study results showed that one single factor is sufficient to explain the scale (EHFSBS) factor structure. Therefore, the questionnaire was considered as a whole. In similar studies, Vellone et al. reported three factors (16), Lee et al. reported two factors (18), Yıldız et al. reported two factors (17), and Köberich et al. reported three factors (14) for the EHFSBS-9 scale, which are different from the findings of the present study. But, Jaarsma et al. (30) and Uchmanowicz et al. (15) reported only one factor (dimension) for this tool, which is in line with the present study. Also, these researchers (15, 30) introduced the Scale (EHFSBS) as a whole (without a factor) scale.

In this study, the criterion validity results showed a significantly positive correlation between SCHFIv.6 (as the criterion) and the EHFSBS questionnaire. Most similar studies (13, 15, 17, 30, 33) investigating the EHFSBS questionnaire's psychometrics did not report the criterion validity. Nevertheless, Lee et al., as well as Vellone et al., have used the SCHFI v.6 questionnaires (16, 18), and Köberich et al. used the Kansas City Cardiomyopathy Questionnaire (KCCQ1) (14) to assess the criterion validity of the EHFSBS-9 scale. It should be said that these researchers have

confirmed the criterion validity of the EHFSBS-9 scale as in the present study.

Internal consistency ($\alpha=0.78$) and stability (ICC=0.89) of the EHFSBS scale were significantly confirmed in the present study. The scale reliability has also been confirmed in other similar studies (14-18, 30, 33). However, the present study's reliability index was lower than some of these studies (15, 16, 18, 30) and higher than the others (14, 17, 33). Finally, it can be said that the results of the present study, in agreement with several previous studies (14-18, 30, 33), approved acceptable reliability of the EHFSBS scale.

In general, the steps were taken for validity (face, content, construct) and reliability in this study are in accordance with the initially designed questionnaire (8). The results of both studies, while confirming nine items, indicated that the EHFSBS-9 questionnaire has sufficient validity and reliability for use in research.

The use of both qualitative and quantitative methods to assess face validity and content validity and the use of criterion validity that has not been comprehensively reported in most studies are considered the advantages of the present study against other studies. One of the limitations of this study is the lack of a sampling framework, making it impossible to select the patients randomly. Therefore, consecutive sampling was sought in this study.

Conclusion

The present study proposed a modified questionnaire to measure self-care behavior in patients with heart failure. Finally, the findings showed that the modified EHFSBS-9 questionnaire has appropriate and validated psychometric properties for measuring self-care behaviors in patients with heart failure. The validity (face, content, construct, and criterion) and reliability (internal consistency and stability) of the questionnaire were desirable and confirmed in the Iranian context. Therefore, this scale can measure the target variables among Iranian patients with heart failure, and

consequently, it can be considered for research and therapeutic purposes.

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Conflict of interest

The authors declare that there are no conflicts of interest in the publication of this study.

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