Original Article

Psychometric evaluation of the nine-item heart failure self-care behavior scale (9-EHFScBS)

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ABSTRACT

Background & Aim: Self-care in patients with heart failure can improve multiple outcomes and reduce mortality. Measuring self-care requires valid and reliable tools. This study aimed to determine the psychometric properties of the 9-items European Heart Failure Self-Care Behavior Scale.

Methods & Materials: The present study is a psychometric evaluation. The original version of the tool was translated from English to Persian using the standard Backward-Forward method. The questionnaire's validity was assessed using face, content, criterion (the Self-Care of Heart Failure Index v.6 as a criterion), and construct validity. An exploratory factor analysis approach was used to construct validity with a sample of 216 patients with chronic heart failure referred to Dr. Shariati and Imam Khomeini Hospital's heart clinics in Tehran; and Ayatollah Mousavi Hospital in Zanjan. The reliability of the questionnaire was evaluated by internal consistency and stability methods.

Results: After the validation process (validity and reliability), all 9 items of the questionnaire were approved and remained. The content validity index of the total content of the questionnaire was calculated to be 0.96. Based on factor analysis, only one factor was confirmed for the questionnaire. The correlation between the present questionnaire and the Self-Care of Heart Failure Index v.6 was positive and significant ($p<0.001$, $r=0.753$). Internal consistency ($\alpha=0.728$) and stability (0.897) of the questionnaire were also confirmed.

Conclusion: The European Heart Failure Self-Care Behavior Scale is valid and reliable for measuring Iranian patients' self-care behaviors with heart failure.

Introduction

Heart failure (HF) is a common clinical syndrome (1) that is increasing dramatically worldwide (2). Around 1% to 2% of adults have this disease, and the prevalence rises to 6% to 10% among people over the age of 65. (3). In the United States, 6.2 million people suffer from heart failure (4), and in Europe, about 3.5 million new patients with HF are diagnosed each year (2). The prevalence rate of this disease in Iran is 3.337 per 100,000 people (1).

Heart failure has a high risk of mortality (2). It is also associated with high levels of hospitalization, increased demand for health care, and premature death. Besides, heart failure destroys the quality of life of the patients (5). Researches have shown that health care costs in patients with HF are four times higher, on average, than the costs for healthy people (6).

Almost half of these patients' hospitalizations can be prevented by implementing recommended self-care programs (7). The effects of self-care programs in patients with HF can be equal to or even greater than the impact of the medications, which will result in maintaining physical health and improving the quality of life among these patients (8).

This is while a recent systematic review of the self-care status showed that the average self-care in patients with HF is lower than the acceptable (9). Therefore, Information, education, and communication for supporting self-care promotion are necessary. Instructing how to conduct and improve self-care activities has been recognized as an effective solution to reduce this disease's burden on patients, their families, and the community (10).

Self-care programs for such patients include 1) raising awareness of their condition, 2) adhering to medication and nutritional recommendations, 3) doing exercises, 4) evaluating the symptoms and controlling them, 5) taking preventive actions such as quitting smoking, restricting alcohol use, and improving body safety (8).

Assessing the efficacy of different interventions requires having a valid and reliable instrument for measuring self-care behaviors. Besides, such scales must be used in different countries to compare applying the instrument (11).

Recently, two instruments, including the European Heart Failure Self-Care Behavior Scale (EHFScBS) and the Self-Care of Heart Failure Index (SCHFI), have been introduced as the most valid and reliable scales for measuring functional changes in heart failure-specific self-care skills and behaviors (12). However, the EHFScBS scale is usually preferred over SCHFI because of the number of questions, ease of use, and comprehensiveness of the instrument (11). Psychometric evaluation of the 9-item EHFScBS questionnaire has been evaluated and confirmed in different contexts such as Spain by González et al. (13), Germany by Köberich et al. (14), Poland by Uchmanowicz et al. (15), Italy by Vellone et al. (16), Turkey by Yıldız et al. (17), and also the United States by Lee et al. (18).

Given the necessity for valid instruments for measuring self-care in the Iran context and the lack of native tool and lack of any psychometric study of the EHFScBS scale in Iran, this study aimed to determine the Psychometric evaluation of the nine-item Heart Failure Self-care Behavior Scale.

Methods

Study design

The present study is methodological research for evaluating psychometric properties of EHFScBS that was performed from August 2017 to December 2018 on patients with chronic heart failure referred to Shariati Hospital and Imam Khomeini Hospital in Tehran and Ayatollah Mousavi Hospital in Zanjan.

Patient population

The participants in this study who met the inclusion criteria and were willing to participate were selected through available sampling. Inclusion criteria included: at least 18 years of age, speaking Persian, and diagnosis of heart failure as confirmed by a cardiologist. Moreover, patients with a history of hospitalization because of heart problems within the past three months, patients with a heart transplant or ventricular device history, and patients with severe cognitive impairment or severe disabilities were excluded.

Study instruments

EHFScBS questionnaire and SCHFIv.6.2 questionnaire (as the criterion) were used simultaneously to determine criterion validity on a sample of 30 patients with heart failure. The EHFScBS questionnaire has nine items, and scoring is based on a 5-point Likert scale (strongly agree (1), partly agree (2), indifferent (3), partly disagree (4), and strongly disagree (5)). The total score ranges from 0-100, and a higher score indicates better self-care (9). The second self-care questionnaire is the SCHFI v 6.2, which was translated into Persian and validated in the Iranian context by Siabani et al. The SCHFI v 6.2 for Persian language-speaking people (pSCHFI) consists of 22 items in three subscales: self-care

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 = $(ne-\text{N}/2)/(\text{N}/2)$ 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 EHFScBS-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 (EHFScBS) 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 EHFScBS-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 (EHFScBS) 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 EHFScBS questionnaire. Most similar studies (13, 15, 17, 30, 33) investigating the EHFScBS 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 EHFScBS-9 scale. It should be said that these researchers have

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

Internal consistency (α=0.78) and stability (ICC=0.89) of the EHFScBS 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 EHFScBS 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 EHFScBS-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 EHFScBS-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.

Conflict of interest

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

References

1. Nadrian H, Shojafard J, Mahmoodi H, Rouhi Z, Rezaeipandari H. Cognitive determinants of self-care behaviors among patients with heart failure: A path analysis. Health Promotion Perspectives. 2018;8(4):275-82.

2. Galiè N, Humbert M, Vachiery JL, Gibbs S, Lang I, Torbicki A, Simonneau G, Peacock A, Vonk Noordegraaf A, Beghetti M, Ghofrani A. 2015 ESC/ERS guidelines for the diagnosis and treatment of pulmonary hypertension: the joint task force for the diagnosis and treatment of pulmonary hypertension of the European Society of Cardiology (ESC) and the European Respiratory Society (ERS): endorsed by: Association for European Paediatric and Congenital Cardiology (AEPC), International Society for Heart and Lung Transplantation (ISHLT). European Heart Journal. 2016 Jan 1;37(1):67-119.

3. Kommuri NV, Johnson ML, Koelling TM. Relationship between improvements in heart failure patient disease-specific knowledge and clinical events as part of a randomized controlled trial. Patient Education and Counseling. 2012 Feb 1;86(2):233-8.

4. Benjamin EJ, Muntner P, Alonso A, Bittencourt MS, Callaway CW, Carson AP, Chamberlain AM, Chang AR, Cheng S, Das SR, Delling FN. Heart disease and stroke statistics—2019 update: a report from the American Heart Association. Circulation. 2019 Mar 5;139(10):e56-28.

5. Hjelm, C. M., Broström, A., Riegel, B., Årestedt, K., & Strömberg, A. (2015). The association between cognitive function and self-care in patients with chronic heart failure. *Heart & Lung*, *44*(2), 113–119.

6. Echouffo-Tcheugui JB, Bishu KG, Fonarow GC, Egede LE. Trends in health care expenditure among US adults with heart failure: The Medical Expenditure Panel Survey 2002-2011. American Heart Journal. 2017 Apr 1;186: 63-72.

7. Jaarsma T, Strömberg A, Gal TB, Cameron J, Driscoll A, Duengen HD, Inkrot S, Huang TY, Huyen NN, Kato N, Köberich S. Comparison of self-care behaviors of heart failure patients in 15 countries worldwide. Patient Education and Counseling. 2013 Jul 1;92(1):114-20.

8. Moser DK, Dickson V, Jaarsma T, Lee C, Stromberg A, Riegel B. Role of self-care in the patient with heart failure. Current Cardiology Reports. 2012 Jun 1;14(3):265-75.

9. Aghajanloo A, Negarandeh R, Janani L, Tanha K, Hoseini-Esfidarjani S-S. Self-care status in patients with heart failure: Systematic review and meta-analysis. Nurs Open. 2021;8:2235–2248.

10. Vellone E, Jaarsma T, Strömberg A, Fida R, Årestedt K, Rocco G, Cocchieri A, Alvaro R. The European Heart Failure Self-care Behaviour Scale: new insights into factorial structure, reliability, precision and scoring procedure. Patient Education and Counseling. 2014 Jan 1;94(1):97-102.

11. Jaarsma T, Årestedt KF, Mårtensson J, Dracup K, Strömberg A. The European Heart Failure Self-care Behaviour scale revised into a nine-item scale (EHFScB-9): a reliable and valid international instrument. European Journal of Heart Failure. 2009 Jan;11(1):99-105.

12. Cameron J, Worrall-Carter L, Driscoll A, Stewart S. Measuring self-care in chronic heart failure: A review of the psychometric properties of clinical instruments. Journal of Cardiovascular Nursing. 2009 Nov 1;24(6):E10-22.

13. González B, Lupón J, Parajón T, Urrutia A, Herreros J, Valle V. Aplicación de la escala europea de autocuidado en insuficiencia cardíaca

(EHFScBS) en una unidad de insuficiencia cardíaca en España [Use of the European Heart Failure Self-care Behaviour Scale (EHFScBS) in a heart failure unit in Spain]. Rev Esp Cardiol. 2006 Feb;59(2):166-70. Spanish.

14. Köberich S, Glattacker M, Jaarsma T, Lohrmann C, Dassen T. Validity and reliability of the German version of the 9-item European Heart Failure Self-care Behaviour Scale. Eur J Cardiovasc Nurs. 2013 Apr;12(2):150-8.

15. Uchmanowicz I, Wleklik M. Polish adaptation and reliability testing of the nine-item European Heart Failure Self-care Behaviour Scale (9-EHFScBS). Kardiologia Polska (Polish Heart Journal). 2016;74(7):691-6.

16. Vellone E, Jaarsma T, Strömberg A, Fida R, Årestedt K, Rocco G, Cocchieri A, Alvaro R. The European Heart Failure Self-care Behaviour Scale: new insights into factorial structure, reliability, precision and scoring procedure. Patient Education and Counseling. 2014 Jan 1;94(1):97-102.

17. Yildiz E, Behice ER. The Turkish Version of Reliability and Validity of Nine Item-European Heart Failure Self-Care Behaviour Scale. Kafkas Journal of Medical Sciences. 2018;8(1):55-60.

18. Lee CS, Lyons KS, Gelow JM, Mudd JO, Hiatt SO, Nguyen T, Jaarsma T. Validity and reliability of the European Heart Failure Self-care Behavior Scale among adults from the United States with symptomatic heart failure. European Journal of Cardiovascular Nursing. 2013 Apr 1;12(2):214-8.

19. Siabani S, Leeder SR, Davidson PM, Najafi F, Hamzeh B, Solimani A, Siahbani S, Driscoll T. Translation and validation of the Self-care of Heart Failure Index into Persian. Journal of Cardiovascular Nursing. 2014 Nov 1;29(6):E1-5.

20. Shahbazzadeh Sh. Development and Psychometric Evaluation of the Instrument for Hookah Smoking Initiation among Women: A Sequential Exploratory Mixed Methods Design. PhD thesis. Tehran University of Medical Science. 2014.

21. Plitcha SB, Kelvin EA. Munro's Statistical Methods for Health Care Research. 6 ed. Philadelphia: Lippincot Williams and Wilkins; 2013.

22. Heravi-Karimooi M, Anoosheh M, Foroughan M, Sheykhi MT, Hajizadeh E. Designing and determining psychometric properties of the Domestic Elder Abuse Questionnaire. Iranian Journal of Ageing. 2010 Apr 10;5(1):7-21.

23. Bryant FB, Yarnold PR. Principal components analysis and exploratory and confirmatory factor analysis. In L. G. Grimm & R R. Yarnold (Eds.), Reading and understanding multivariale statistics. 1995. Washington, DC: American Psychological Association.

24. Meyers LS, Gamst GC, Guarino AJ. Applied Multivariate Research: Design and Interpretation. SAGE Publications, 2012.

25. Jafari H, Saeidi N, Kaabi AM, Noshadi E, Hallafi HR. Application of exploratory factor analysis method in the evaluating the competitiveness of port services. Journal of Marine Science and Technology. 2015;14(2):96-112.

26. Heidarali H. The provide and standardize the measures of job satisfaction Publications State Management Training Center. Tehran, 2002.

27. Souza AC, Alexandre NMC, Guirardello EB. Psychometric properties in instruments evaluation of reliability and validity. Epidemiol Serv Saude. 2017 Jul-Sep;26(3):649-659.

28. Flodén A, Lennerling A, Fridh I, Rizell M, Forsberg A. Development and psychometric evaluation of the instrument: attitudes towards organ donor advocacy scale (ATODAS). The Open Nursing Journal. 2011; 5:65-73.

29. Baumgartner TA, Chung H. Confidence limits for intraclass reliability coefficients. Measurement in Physical Education and Exercise Science. 2001 Sep 1;5(3):179-88.

30. Jaarsma T, Strömberg A, Mårtensson J, Dracup K. Development and testing of the European heart failure self-care behaviour scale. European Journal of Heart Failure. 2003 Jun;5(3):363-70.

31. Mohammadbeigi A, Mohammadsalehi N, Aligol M. Validity and reliability of the instruments and types of measurments in health applied researches. Journal of Rafsanjan University of Medical Sciences. 2015 Mar 10;13(12):1153-70.

32. Polit DF, Beck CT. Nursing Research: Generating and Assessing Evidence for Nursing Practice. Wolters Kluwer Health/Lippincott, Williams & Wilkins, Philadelphia. 2008.

33. Lin CY, Pakpour AH, Broström A, Fridlund B, Årestedt K, Strömberg A, Jaarsma T, Mårtensson J. Psychometric properties of the 9-item European Heart Failure Self-Care Behavior Scale using confirmatory factor analysis and Rasch analysis among Iranian patients. Journal of Cardiovascular Nursing. 2018 May 1;33(3):281-8.