

# A Psychometric Examination of Persian Self-Care Activities Screening Scale (SASS-14) during COVID-19

**Rasol Rahmani**

Zahedan University of Medical Sciences

**Morteza Rostamian**

Gonabad University of Medical Sciences

**3. Fatemeh Mohammadzadeh**

Gonabad University of Medical Sciences

**Mohamad Reza Rahmani**

Gonabad University of Medical Sciences

**Fatemeh yaghoobi moghadam** (✉ [f.yaghoobi.m@gmail.com](mailto:f.yaghoobi.m@gmail.com))

Gonabad University of Medical Sciences

---

## Research Article

**Keywords:** Validation, Psychometrics, SASS-14 scale, Iran

**Posted Date:** June 22nd, 2022

**DOI:** <https://doi.org/10.21203/rs.3.rs-1660865/v1>

**License:** © ⓘ This work is licensed under a Creative Commons Attribution 4.0 International License. [Read Full License](#)

---

## Abstract

**Introduction:** Self-care is an important and valuable principle in today's society due to its emphasis on the active role of individuals in maintaining their health. This study aims to investigate the psychometric properties of the Persian version of the Self-Care Activities Screening Scale (SASS-14) during COVID-19.

**Methods:** After obtaining the written permission, SASS-14 was translated into Persian from the original English version. A convenient sampling of 400 Iranian people from March to November 2021 completed the online Persian questionnaire through social media. The construct validity evaluated via Explanatory Factor Analyses (EFA) and confirmed using Confirmatory Factor Analysis (CFA). The convergent validity was evaluated using Spearman correlation coefficients between the SASS-14 and Satisfaction With Life Scale (SWLS) and 36-Item Short-Form Health Survey (SF-36). Its reliability was assessed through internal consistency and test-retest intra-class correlation coefficient (ICC).

### Results:

The results of the present study showed that the Persian version of the scale (SASS-14) has the desired content and construct validity for use in Iranian society as the original scale. All items of the questionnaire obtained CVR scores greater than 0.62 and only two items were revised for CVI value. The results of the CFA confirmed the structure of the four-factor model with 14 items, and the indices of model fit showed that the model was sufficiently consistent with the data. Moreover, Cronbach's alpha coefficient and ICC values indicate a desirable level of internal consistency and test-retest reliability.

**Conclusion:** The results of the study showed that the Persian SASS-14 scale enjoys good reliability and validity. This scale is useful for assessing the self-care activities in Iranian people during COVID-19.

## Introduction

Health is the ability to adapt and self-manage in the face of social, physical, and emotional challenges (1). Self-care is an essential and valuable principle in today's society because it emphasizes the active role of individuals in maintaining their health (2). In addition, self-care is one of the emerging operational strategies for chronic and infectious diseases management and prevention, leading to more energy and positive feeling, reducing stress, healthy feeling, increasing self-confidence, and progress of people's health level in the community (6 – 3). Currently, the persistent outbreak of a respiratory disease known as coronavirus disease 2019 (COVID-19) threatens the health of human society (7). On January 30, 2020, the World Health Organization (WHO) declared an international health emergency based on information obtained from Wuhan, China, and other parts of the world (8). Coronavirus disease (COVID-19) is a new respiratory disease whose symptoms range from severe colds to acute respiratory symptoms (9). It has spread rapidly around the world and created public health emergencies, especially in vulnerable groups (10). WHO considers it a global public health concern (11). People in the community experience a wide range of symptoms of stress and mental disorders, including mood swings, insomnia, stress, anxiety, anger, irritability, emotional exhaustion, depression, and post-traumatic stress symptoms. Furthermore, low morale and irritability are particularly common (12). However, engaging in self-care activities as part of health measures can help us control stress and prevent health problems and symptoms (13). The Self-Care Activities Screening Scale (SASS-14) questionnaire was developed in the COVID-19 epidemic.

SASS-14 is a reliable and concise instrument that measured self-care activities in the general Spanish-speaking population during a quarantine situation. In general, it can be especially useful for quickly examining the promotion of health behaviors among people. Further, it can be very helpful in taking care of oneself during stressful experiences such as quarantine conditions. The SASS-14 questionnaire is a short, fast, and available online questionnaire, meaning that health care professionals can easily apply it remotely for self-care screening and healthy behavior during quarantine (14).

Given the importance of the prevalence of coronavirus disease (COVID-19) as a contagious infectious disease and the importance of self-care and prevention, providing self-care services can be a substantial achievement for people in the community. Therefore, due to the lack of an accurate and local tool that precisely evaluates and scrutinizes self-care behaviors for coronavirus disease 2019, this study aims to develop and validate the psychometric properties of the Persian version SASS-14 during COVID-19.

## Materials And Methods

This study was performed in two stages, including translating the SASS-14 questionnaire from English to Persian and examining the psychometric properties of the SASS-14 questionnaire.

## Measurements

### Socio-demographic questionnaire

The checklist contained several items, including age, gender, marital status, education, occupation, place of residence, and income.

### The SASS-14 questionnaire

This questionnaire was first designed by Martínez et al. (14) in 2021 to screen self-care activities in the COVID-19 epidemic. This questionnaire contains 14 items, coded as a Likert scale from one (never) to six (always). The minimum and maximum scores of the questionnaire are 0 and 84, respectively. The higher scores indicate higher levels of self-care. The SASS-14 consists of four subscales: health awareness (five items); nutrition and physical activity (three items); sleep quality (two items); and social support, interpersonal skills, and leisure activities, which include personal and interpersonal coping strategies (four items).

## Satisfaction with life scale (SWLS)

This scale was developed by Diner et al. (1985) and consists of five statements that measure the cognitive component of actual well-being (15). The psychometric properties of the Persian scale were assessed by Bayani et al. in 2007. Its structural validity was assessed via convergent validity using the Oxford Happiness List and Beck Depression Inventory; Cronbach's alpha showed 0.83, and test-retest indicated 0.69 reliability (16).

## 36-Item Short-Form Health Survey (SF-36)

This questionnaire was developed to assess the overall state of health and disability (17). The score range is between 0 and 100, and higher scores indicate a higher quality of life. The Persian version of this scale showed a good level of validity and reliability in the Montazeri et al.'s study in 2005 (17).

## Stage 1: Translation Process

After obtaining written permission, the original version of SASS-14 was translated from English to Persian in several steps. In the first stage, two qualified and independent translators (a Reproductive Health Specialist and an English Language Specialist) translated the original English version into Persian (backward translation). Next, the translations were compared and evaluated in terms of quality, and the most appropriate translation for the phrases was selected to reach a single translation. Then, the final translated version was given to two English Language Specialist who had not seen the original English text in order to translate it from Persian to the original language (back translation) to ensure the accuracy of the translation. Finally, all translations and the original version were reviewed and compared by a panel of experts, and the final Persian version was approved.

## Stage 2: Psychometric Properties

### Design, participants, and sampling

Participants in this cross-sectional study were selected from the population of different towns in Iran using a convenient sampling strategy from March to November 2021. A link, including study objectives and questionnaires items, was sent via SMS, related groups, and channels available in WhatsApp, Telegram, and Instagram applications. They completed the questionnaire if they met the inclusion criteria. They were also asked to share the questionnaire with other individuals, groups, and channels they knew. The inclusion criteria were willingness to participate in the study, age over 18 years, literacy in reading and writing, and absence of diagnosed mental disorders such as depression, anxiety, and obsession in recent weeks. The subject-to-item ratio method is often used to determine the sample size required for Exploratory Factor Analysis (EFA) (18). There are different recommendations from 2 to 20 people for each item and a minimum sample size of 100 to 250 is suggested (19). Moreover, recommendations in the literature for sample size in Confirmatory Factor Analysis (CFA) vary from 150 to 1000 people (19). In this study, according to the number of items in the questionnaire (14 items), the minimum sample size required was 140 people (10 times the number of items), which was increased to 200 samples in order to comply with the minimum sample size. To perform EFA and CFA on separate samples, reaching 400 samples were targeted.

### Data Analysis

#### Content Validity

Eight health experts, one instrumentation specialist, and a clinical specialist (10 people in total) approved the content validity of the final Persian version. To determine the Content Validity Ratio (CVR), a triple Likert scale was chosen (necessary, useful but not necessary, not necessary). The content validity of each item was confirmed if it had a CVR > 0.62, according to the Lawshe table. To determine the Content Validity Index (CVI), each expert was asked to consider relevance, clarity, simplicity, and ambiguity for each item using a 4-point Likert scale; questions with CVI > 0.79 were considered appropriate.

#### Construct Validity

Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA) were used to evaluate the construct validity. For this purpose, the data were first randomly divided into two equal parts. The first sub-sample (n = 200) was used for EFA, and the second sub-sample (n = 200) was used for CFA. Before performing EFA and CFA, the multivariate normality assumptions were tested using skewness and kurtosis values and chi-square versus Mahalanobis distance plot. The values of Skewness and Kurtosis between - 2 and + 2 and the placement of points on a straight line in the graph indicate the normality of the data (20). The presence of multicollinearity was also assessed by Variance Inflation Factor (VIF); VIF < 3 was considered as the absence of multicollinearity (21).

Data adequacy for EFA was also assessed using Bartlett's test and the Kaiser-Meyer-Olkin index (KMO). Significance (rejection of null hypothesis) in Bartlett's test and KMO value above 0.7 was considered acceptable (22). Principal Component Analysis (PCA) and Varimax rotation were used to extract the factors. Based on the assumption that the scale is not one-dimensional, the number of factors was considered 4 according to the number of factors in the original version of the scale. The adequacy of the number of factors was evaluated based on special values greater than one using Scree diagrams. Items with a factor load greater than 0.5 and with a minimum difference of 0.2 with other factors were retained (23). CFA was done on the second sample based on the factors extracted from the EFA model (based on the maximum likelihood estimation). The model fit indices, including  $\chi^2 / df$ , Goodness-of-Fit Index (GFI), Adjusted Goodness-of-Fit-Index (AGFI), Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), Root Mean Square Error of Approximation (RMSEA) and Normed Fit Index (NFI) were also evaluated.

## **Convergent Validity**

To determine the convergent validity, along with SASS-14, SWLS and SF-36 were completed without time interval by the participants. Then, the correlation coefficient between the responses of these scales was determined and calculated. Correlation coefficients were determined as follows: less than 0.1 weak, between 0.1 to 0.5 moderate, between 0.5 to 0.8 strong, and values greater than 0.8 as very strong (24).

## **Reliability**

The reliability of the Persian SASS-14 questionnaire was assessed using Cronbach's alpha coefficient method and test-retest method with an interval of two weeks between 30 people. A Cronbach's alpha value between 0.6 and 0.7 indicates an acceptable level of reliability and a value greater than or equal to 0.8 indicates good reliability (25). Test-retest reliability was determined using the Intraclass Correlation Coefficient (ICC) and values greater than 0.75 were considered good reliability, between 0.5 to 0.75 moderate, and less than 0.5 as poor (26).

## **Results**

### **Characteristics of participants**

The individual characteristics of the participants are listed in Table 1 for EFA and CFA.

Table 1  
The participants' characteristics

Variable	Total sample (n = 400)	EFA sample (n = 200)	CFA sample (n = 200)	p-value*
<b>Age, n (%)</b>				0.48
18–28	224 (56.1)	116 (58.3)	108 (54.0)	
29–39	57 (14.3)	23 (11.6)	34 (17.0)	
40–49	39 (9.8)	18 (9.0)	21 (10.5)	
50–59	33 (8.3)	16 (8.0)	17 (8.5)	
≥ 60	46 (11.5)	26 (13.1)	20 (10.0)	
<b>Gender, n (%)</b>				0.84
Male	194 (48.5)	96 (48.0)	68 (49.0)	
Female	206 (51.5)	104 (52.0)	102 (51.0)	
<b>Marital status, n (%)</b>				
Single/divorced/widowed	200 (50.0)	101 (50.5)	99 (49.5)	
Married	200 (50.0)	99 (49.5)	101 (50.5)	
<b>Educational level</b>				0.08
High school or less	24 (6.0)	16 (8.0)	8 (4.0)	
Diploma	111 (27.8)	62 (31.0)	49 (24.5)	
Associate's degree	65 (16.2)	33 (16.5)	32 (16.0)	
Master degree or higher	200 (50.0)	89 (44.5)	111 (55.5)	
<b>Place of living</b>				0.18
City	347 (86.8)	169 (84.5)	178 (89.0)	
Village	53 (13.2)	31 (15.5)	22 (11.0)	
<b>Occupation</b>				0.37
Employee	87 (21.8)	42 (21.0)	45 (22.5)	
Housewife	58 (14.5)	25 (12.5)	33 (16.5)	
Student	205 (51.2)	107 (53.5)	98 (49.0)	
Other	50 (12.5)	26 (13.0)	24 (12.0)	
<b>Income</b>				0.76
Low	117 (29.2)	56 (28.0)	61 (30.5)	
Moderate	249 (62.2)	128 (64.0)	121 (60.5)	
High	34 (8.5)	16 (8.0)	18 (9.0)	
* Chi-square test p-value				

The mean age of participants was 33.18 (SD = 15.76), which ranged from 18 to 87 years; 51.5% of the participants were female. The samples did not differ statistically significantly in terms of individual characteristics.

## Content Validity

All items of the questionnaire obtained CVR scores greater than 0.62 of the Lawshe table (see Table 2).

Table 2  
CVI, CVR and factor loading of *the SASS-14* Persian questionnaire (n = 200).

	Item	Item content	Content Validity		Factor loading				
			CVI	CVR	F1	F2	F3	F4	
Health consciousness	1	English	I am alert to changes in my health	0/96	1	0.80			
		Persian	من به تغییرات سلامتی من متوجه می‌شوم.						
	2	English	I am usually aware of my health	0/9	0/75	0.77			
		Persian	معمولاً من به سلامتی من متوجه می‌شوم.						
	3	English	I reflect about my health a lot	0/95	1	0.79			
Persian		بسیار در مورد سلامتی من فکر می‌کنم.							
4	English	I know my inner feelings about my health	0/875	0/75	0.70				
	Persian	من احساس درونی من در مورد سلامتی من را می‌دانم.							
5	English	I am constantly examining my health	0/95	1					
	Persian	من دائماً سلامتی من را بررسی می‌کنم.							
Nutrition and Physical Activity	6	English	I do physical activity (some sport, yoga or dance) for at least 30 min a day	1	0/5			0.58	
		Persian	(بعضی ورزش یا یوگا یا رقص) حداقل 30 دقیقه در روز فعالیت بدنی می‌کنم.						
	7	English	I eat three servings of fruit and two of vegetables daily	0/95	0/75			0.57	
		Persian	من سه وعده میوه و دو وعده سبزیجات در روز می‌خورم.						
	8	English	I think I am eating better than I used to (less sugar, salt, fried snacks or precooked food)	0/96	0/75			0.56	
Persian		من فکر می‌کنم که من بهتر از آنچه قبلاً می‌خوردم (کمتر شکر، نمک، غذاهای سرخ‌شده یا غذاهای نیمه‌آماده می‌خورم).							
9	English	I'm drinking an average of 8 glasses of water a day	1	0/75			0.70		
	Persian	من در روز به طور متوسط 8 لیوان آب می‌نوشم.							
Sleep quality	10	English	I sleep 7–8 h a day	1	1	0.82			
		Persian	من 7-8 ساعت در روز می‌خوابم.						
11	English	I think that my rest is of quality	0/95	1	0.81				
	Persian	من فکر می‌کنم که استراحت من با کیفیت است.							
Interpersonal and Intrapersonal coping strategies	12	English	I am learning to do new things like: playing an instrument, sports, practicing a new language, cooking, painting, new apps, video games, etc. ...	1	0/75			0.59	
		Persian	من در حال یادگیری انجام کارهای جدیدی مانند: نواختن ساز، ورزش، یادگیری یک زبان جدید، آشپزی، نقاشی، اپ‌های جدید، بازی‌های ویدیویی، و غیره ... هستم.						
	13	English	I actively participate in the initiatives of my community (e.g.: clapping, singing, playing music, offering my support in what I could help, etc.)	1	1			0.71	
Persian		من به طور فعال در ابتیاهای جامعه من شرکت می‌کنم (مثلاً: تشویق، آواز خواندن، نواختن ساز، ارائه حمایت من در آنچه می‌توانم کمک کنم، و غیره).							
14	English	I am finding moments to be more connected to myself (I observe, write or reflect on my thoughts, emotions or behaviors)	1	1			0.69		
	Persian	من لحظاتی را پیدا می‌کنم که بتوانم بیشتر با خودم ارتباط داشته باشم (من مشاهده می‌کنم، می‌نویسم یا بر روی افکار، احساسات یا رفتارهای من تأمل می‌کنم).							
Eigenvalues						2.97	1.80	1.68	1.54
% of variances						22.85	13.85	12.92	11.83

The CVI value for 12 items of the questionnaire was more than 0.79 and only two questions were reworked and corrected. After correction, the content validity of all 14 questions was confirmed.

## Construct Validity

In EFA, the KMO value was 0.74, which indicates the adequacy of the samples. The result of Bartlett's test also showed a significant relationship between items ( $\chi^2(78) = 700.64, p < 0.001$ ). Thirteen items were approved by the EFA in four factors (item 5 was deleted after the Varimax rotation in order to achieve a more interpretable model). The percentage of changes expressed by four factors with eigenvalues more than one was 61.45. After Varimax rotation, the variance explained by the first to fourth factors was 22.85, 13.85, 12.92 and 11.83, respectively. Scree plots also confirmed the adequacy of the four-factor model. Factor loading of items ranged from 0.56 to 0.82 (see Table 2).

The results of the CFA confirmed the structure of four-factor model with 13 items, and the model fit indices showed that the model was sufficiently consistent with the data (see Table 3).

Table 3  
Model fit indices of CFA

Index	Value	Thresholds	Result
$\chi^2 / df$	1.53	$0 \leq \chi^2 / df \leq 2$ : Good; $2 < \chi^2 / df \leq 5$ : Acceptable (27)	Good fit
RMSEA	0.05	$0 \leq RMSEA \leq 0.05$ : Good; $0.05 < RMSEA \leq 0.08$ : Acceptable (28)	Good fit
GFI	0.94	$0.95 \leq GFI \leq 1.00$ : Good; $0.90 \leq GFI < 0.95$ : Acceptable (29)	Acceptable fit
AGFI	0.90	$0.90 \leq AGFI \leq 1.00$ , close to GFI : Good; $0.85 \leq AGFI < 0.90$ , Close to GFI : Acceptable (30)	Good fit
NFI	0.84	$0.95 \leq NFI \leq 1.00$ : Good; $0.90 \leq NFI < 0.95$ : Acceptable (31)	Close to acceptable fit
CFI	0.94	$0.95 \leq CFI \leq 1.00$ : Good; $0.90 \leq CFI < 0.95$ : Acceptable (32)	Acceptable fit
TLI	0.91	$0.95 \leq TLI \leq 1.00$ : Good; $0.90 \leq TLI < 0.95$ : Acceptable (33)	Acceptable fit
Notes: RMSEA, Root Mean Square Error of Approximation; GFI, Goodness-of-Fit Index; AGFI, Adjusted Goodness-of-Fit-Index; NFI, Normed Fit Index; CFI, Comparative Fit Index; TLI, Tucker-Lewis Index.			

The standard coefficients of the model approved in the CFA are shown in Fig. 1.

## Convergent Validity

Spearman correlation coefficient between the scores of SASS-14 and SF-36 questionnaires ( $r = 0.21, P < 0.001$ ) as well as SWLS ( $r = 0.17, P = 0.001$ ) disclosed positive and significant correlations although they were not strong.

The Cronbach's alpha coefficient revealed 0.70 for the whole scale, which indicates a good level of internal consistency. Moreover, the ICC value in the retest reliability test was 0.96 for the whole scale and 0.61 to 0.82 for the subscales, which indicates a good level of reliability.

## Discussion

Self-care is part of daily life that includes acquired, conscious and purposeful actions that people take for themselves, their children and their families to stay healthy, protect their mental and physical health, meet their social and psychological needs and prevent illnesses or accidents, take care of chronic illnesses and conditions, and protect their health after acute illness or hospital discharge. Self-care clearly increases individual efficiency and skills and is one of the main concepts for emphasizing healthy behavior (34).

Self-care is especially important during an outbreak of an epidemic such as the COVID-19 epidemic. Epidemic disease is not only a cause for concern for physical health but also causes a number of psychological illnesses, including stress and anxiety (35). Therefore, study and research in this field is of prime importance. Standard questionnaires are needed to assess self-care behaviors in the general population during a quarantine situation such as the COVID-19 epidemic, which can be particularly useful for rapidly assessing health behaviors among the population.

Due to the lack of a Persian screening questionnaire for self-care activities during COVID-19 epidemic in the Iranian community, the present study was performed to develop and validate a Persian self-care questionnaire. The results of the present study showed that the Persian version of SASS-14 scale and its dimensions during COVID-19 disease have the desired validity and reliability for use in Iranian society as the original scale.

We did not encounter major problems in the process of translation and cultural adaptation of the SASS-14 questionnaire meaning that the changes made to the questionnaire were not fundamental. The CVI values for 12 items of the questionnaire were more than 0.79, and only two questions need to be revised, which was finally confirmed. Cronbach's alpha coefficient for the whole scale was 0.70, which indicates a desirable level of internal consistency, while Cronbach's alpha value for the subscales ranged from 0.61 to 0.82, which again indicates an acceptable and good level of reliability. Further, the ICC value in the test-retest method was 0.96, which indicates a good internal reliability.

The results of the CFA confirmed the structure of the 13-item model with 13 items, and the indicators of model fit showed that the model was sufficiently consistent with the data. Likewise, Spearman correlation coefficient between the scores of Persian SASS-14 questionnaire and the short form of health surveying questionnaire as well as life satisfaction scale, revealed positive and significant result that confirmed the criterion validity of the Persian questionnaire, although the correlations were not strong. Finally, EFA results showed that the Persian scale corresponds to the original scale in terms of number and items inside each category and it was not necessary to delete or replace the items that confirms the construct validity of the questionnaire.

This questionnaire has not been validated in Iran so far. In order to validate and localize it, sampling was performed in several cities and villages of Iran, which increases the scope of findings to the Iranian community, and reduces the need for further localization. In fact, a well-established and validated scale in a society could be used with high confidence in future studies (36). Measuring self-care of individuals in COVID-19 epidemic in Iran is necessary and localization of this questionnaire would be an innovative solution for this purpose.

## Limitations

One of the limitations of the study was that sampling was not performed in all provinces of Iran and was done in provinces such as Khorasan, Tehran, Isfahan, Gilan, Fars and Mazandaran which may affect the generalization of results to the whole country.

## Abbreviations

AGFI: Adjusted Goodness-of-Fit-Index

CFA: Confirmatory Factor Analysis

CFI: Comparative Fit Index

CVI: Content Validity Index

CVR: Content Validity Ratio

EFA: Exploratory Factor Analysis

GFI: Goodness-of-Fit Index

ICC: Intraclass Correlation Coefficient

KMO: Kaiser-Meyer-Olkin index

NFI: Normed Fit Index

RMSEA: Root Mean Square Error of Approximation

SASS: Self-Care Activities Screening Scale

SF-36: 36-Item Short Form Health Survey

SWLS: Satisfaction with Life Scale

TLI: Tucker-Lewis Index

VIF: Variance Inflation Factor

WHO: World Health Organization

## Declarations

### Ethical considerations

This study was approved by the ethics committee of Gonabad University of Medical Sciences (IR.GMU.REC.1400.022). The objectives of the study were explained to the participants at the beginning of the online questionnaire and all participants participated in the study with informed consent. It was also possible for participants to withdraw from the study during the study, and the confidentiality of information was maintained. This study was in line with the ethical principles set out in the Helsinki Declaration.

### Acknowledgements

The researchers thank all the participants who responded to the questionnaire from different cities, as well as the Social Development and Health Promotion Research Center of Gonabad University of Medical Sciences.

### Authors' contributions

R.R., F.M., M.R. and F.Y.: proposed the concept and design of the study; R.R., F.M., and M.R. drafted the first manuscript; F.M. was done the statistical analysis; F.Y., F.M., and R.R., and M.R. have done the critical revision of the manuscript for important intellectual content.

## Funding

This study was supported in by a Grant-in-Aid from the Social Development & Health Promotion Research Center affiliated with Gonabad University of Medical Sciences.

## Availability of data and materials

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

## Ethics approval and consent to participate

The present study was approved by the Gonabad University of medical science Research Ethics Committee (code: IR.GMU.REC.1400.022).

## Consent for publication

Not applicable.

## Competing interests

The authors have no competing interests.

## References

1. Huber M, Knottnerus JA, Green L *et al.* (2011) How should we define health? *Br Med J.* 26(2):343. <https://doi.org/10.1136/bmj.d416>.
2. El-osta A, Webber D, Gnani S L *et al.* (2011) The self-care matrix: a unifying framework for self-care. *Selfcare J.* 2019; 13:1–16.
3. ValdezRS, HoldenRJJ *et al.* (2016) *Healthcare human factors/ergonomics fieldwork in home and community settings.* 24(4):4-9
4. SrinivasP, CornetV, HoldenR (2017) *J I Jo HCI. Human factors analysis, design, and evaluation of Engage, a consumer health IT application for geriatric heart failure self-care.* 33(4):298-312. [DOI:10.1080/10447318.2016.1265784
5. RiegelB, DicksonVV, FaulknerK (2016) *MJ Jo CN. The situation-specific theory of heart failure self-care: revised and updated.* 31(3):226-35
6. NovakLL, UnertlKM, HoldenRJJ (2016) *Siht, informatics. Realizing the potential of patient engagement: designing IT to support health in everyday life.* 222:237.
7. Fauci AS, Lane HC, Redfield RR (2020) COVID-19—navigating the uncharted. *Mass Medical Soc.*
8. Velavan TP, Meyer CG (2020) The COVID-19 epidemic. *Tropical medicine & international health.* 25(3):278.
9. Flesia L, Monaro M, Mazza C *et al.* (2020) Predicting Perceived Stress Related to the Covid-19 Outbreak through Stable Psychological Traits and Machine Learning Models. *Journal of clinical medicine.* 9(10):3350.
10. Dashraath P, Jeslyn WJL, Karen LMX *et al.* (2020) Coronavirus disease 2019 (COVID-19) pandemic and pregnancy. *American journal of obstetrics and gynecology.*
11. Organization WH. Mental health and psychosocial considerations during the COVID-19 outbreak, 18 March 2020. World Health Organization; 2020
12. Brooks SK, Webster RK, Smith LE *et al.* (2020) The psychological impact of quarantine and how to reduce it: rapid review of the evidence. *Lancet.* 395:912–20. [https://doi.org/10.1016/S0140-6736\(20\)30460-8](https://doi.org/10.1016/S0140-6736(20)30460-8).
13. Miller J, Hartman T, Levita L *et al.* (2020) Capability, opportunity and motivation to enact hygienic practices in the early stages of the COVID-19 outbreak in the UK; p. 1–26. <https://doi.org/10.1111/bjhp.12426>.
14. Martínez M, Elkin O. Luis1 *et al.* (2021) Pablo Fernández-Berrocal, Ainize Sarrionandia, Marta Vidaurreta and Elena Bermejo-Martins. Validity and reliability of the Self-Care Activities Screening Scale (SASS-14) during COVID-19 lockdown. *Martínez et al. Health Qual Life Outcomes* 19:1 <https://doi.org/10.1186/s12955-020-01607-6>.
15. Diener ED, Emmons RA, Larsen RJ *et al.* (1985) The satisfaction with life scale. *Journal of personality assessment.* 1;49(1):71-5.
16. Bayani AA, Koocheky AM, Goodarzi H (2007) The reliability and validity of the satisfaction with life scale. *Journal of Iranian psychologists.* 1;3(11):259-60.
17. Montazeri A, Goshtasebi A, Vahdaninia M *et al.* (2005) The Short Form Health Survey (SF-36): translation and validation study of the Iranian version. *Quality of life research.* 14(3):875-82.
18. Anthoine E, Moret L, Regnault A *et al.* (2014) a review of publications on newly-developed patient reported outcomes measures. *Health and quality of life outcomes.* 12(1):1-0.
19. Anthoine E, Moret L, Regnault A *et al.* (2014) a review of publications on newly-developed patient reported outcomes measures. *Health and quality of life outcomes.* 12(1):1-0.
20. Burdenski T (2000) Evaluating univariate, bivariate, and multivariate normality using graphical and statistical procedures. *Multiple Linear Regression Viewpoints;* 26(2):15-28
21. Hair, J. F., Babin, B. J., Anderson, R. E *et al.* (2018) *Multivariate Data Analysis.* In *Multivariate data analysis (8th ed.)*. Cengage Learning. 10.1002/9781119409137.ch4.
22. Watkins MW (2018) Exploratory Factor Analysis: A Guide to Best Practice. *Journal of Black Psychology* 44(3):219-246. doi:10.1177/0095798418771807

23. Brown TA(2015) Confirmatory factor analysis for applied research. New York: Guilford Publications.Return to ref 39 in article
24. Muijs D. Doing quantitative research in education with SPSS. London: Sage Publications; 2011
25. Hulin, C., Netemeyer, R., and Cudeck, R (2001) Can a Reliability Coefficient Be Too High? Journal of Consumer Psychology, Vol. 10, Nr. 1, 55-58.
26. Foundations of Clinical Research(2000) Applications to Practice (second ed.), Prentice Hall Health, Upper Saddle River
27. Byrne, B. M. (2010) Structural equation modeling with AMOS: basic concepts, applications, and programming (multivariate applications series). New York: Taylor & Francis Group, 396, 7384
28. Schermelleh-Engel, K., Moosbrugger, H. & Müller, H (2003) "Evaluating the fit of structural equation models: Tests of significance and descriptive goodness-of-fit measures". Methods of psychological research online, 8(2): 23-74
29. Marsh, H. W., Balla, J. R., & McDonald, R. P (1988) Goodness-of-fit indexes in confirmatory factor analysis: The effect of sample size. Psychological bulletin, 103(3), 391.
30. Doll, W. J., Xia, W., & Torkzadeh, G (1994) A confirmatory factor analysis of the end-user computing satisfaction instrument. MIS quarterly, 453-461.
31. Hair, J., Black, W. C., Babin, B. J *et al.* (2010) Multivariate data analysis a global perspective (global edition). Edinburgh gate.
32. Hu, L. T., & Bentler, P. M (1999) Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. Structural Equation Modeling: a Multidisciplinary Journal, 6(1), 1-55.
33. Schermelleh-Engel K, Moosbrugger H, Müller H(2003) Evaluating the fit of structural equation models: Tests of significance and descriptive goodness-of-fit measures. Methods of psychological research online. 25;8(2):23-74.
34. Rafeifar, Shahram(2015) Executive Instruction of the National Self-Care Program. First Edition. Tehran: Sculpture Publishing. Page: 9-6.
35. Lai J, Ma S, Wang Y *et al.* (2020) Factors associated with mental health outcomes among health care workers exposed to coronavirus disease 2019. JAMA network open. 3(3):e203976-e
36. Semnani S, Heravi-Karimooi M, Rejeh N *et al.* (2019) Translation and Primary Validation of the Persian Version of the Heart Failure Knowledge Scale (HFKS). Journal of the Iranian Institute for Health Sciences Research[ EPub a head of print-18 May 2019]

## Figures

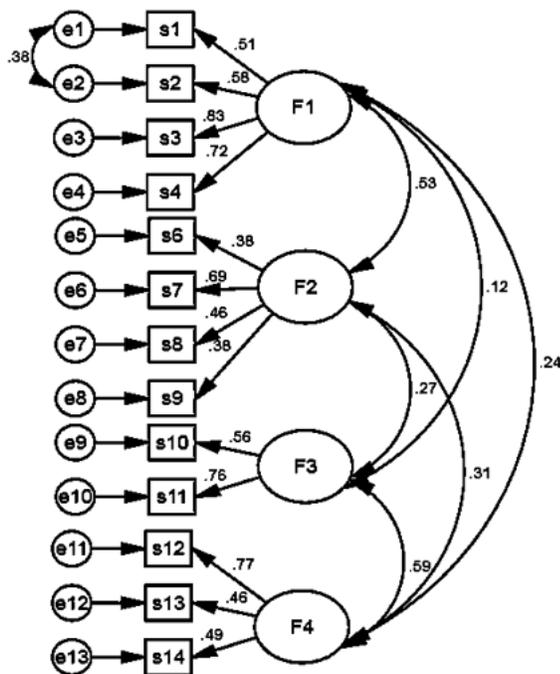


Figure 1

Diagram of the correlated four-factor model with standardized estimates validated in subsample 2.