

# Psychometric Properties of Persian Version of the Bakas Caregiving Outcomes Scale

## Abstract

**Background:** Caregivers of stroke patients have many problems due to caring for patients. This study aimed to evaluate the psychometric properties of the Persian Version of the Bakas Caregiving Outcomes Scale (BCOS) in caregivers of stroke patients. **Materials and Methods:** This methodological study was conducted in 2018 with 191 caregivers of stroke patients. In order to assess the scale validity and reliability, the face, content, internal consistency, stability of the scale, and construct validity (exploratory and confirmatory factor analysis) were done. **Results:** The scale face and content validity qualitatively were checked and confirmed by caregivers' and experts' opinions. In the reliability, Cronbach's alpha was obtained to be 0.93. The test-retest was conducted on 30 participants and showed good stability after 2 weeks. The Intraclass Correlation Coefficient (ICC) for the total scores was reported to be 0.94. The Kaiser-Meyer-Olkin  $p$  value was 0.90, Bartlett's sphericity test was significant ( $p < 0.001$ ), in the exploratory factor analysis, 2 factors with 14 items were extracted. The confirmatory factor analysis confirmed the appropriate model with 14 items (removal of item 13) with two factors at the expected level. **Conclusions:** The Persian version of the 14 items of the BCOS indicates satisfactory reliability, and validity in the Iranian caregivers of stroke patients.

**Keywords:** Caregivers, patients, stroke, validation study

## Introduction

Stroke is a vascular disorder with a sudden onset or gradual destruction of the brain vessels that can occur within 24 h or more. It is the world's first cerebrovascular disorder and the third foremost cause of death in the world after cardiovascular disease and cancer.<sup>[1]</sup> In 2018, 1 in every 6 deaths from cardiovascular disease was due to stroke. In the United States, about 795,000 individuals experience new or recurrent strokes per year, and the prevalence of stroke in people over 20 years old is about 6.5 million.<sup>[1,2]</sup> In Iran, 384 people per 100,000 suffer strokes each year, which is the most common cause of disability in the adult age group of Iran.<sup>[3]</sup> The mortality rate has decreased in the first 30 days after stroke due to advances in emergency care and the acute stage of the disease. There is also considerable evidence that with the increase in organized care following the acute phase, patients who are regularly cared for by the care team for the first 4 weeks have a significant reduction in mortality. Despite these efforts, studies have shown that stroke causes

many disabilities in the United States and worldwide. Studies have shown that nearly 50 million stroke survivors worldwide are affected by numerous physical, cognitive, and emotional disorders, with 25%–75% of these people being relatively or fully dependent on their family or caregiver for daily living activities.<sup>[4]</sup>

In Iranian culture and society, the family is the most influential institution in all life. Families in this culture play the most significant role in individuals' empowerment, support, security, and dependency.<sup>[5,6]</sup> Therefore, family members make an effort to help each other by maintaining each other's structure, function, and emotions. Family caregivers play an important role in providing health care in Iranian families.<sup>[6]</sup> Stroke patients who are discharged are unable to perform rehabilitation and treatment programs due to their motor, mental, and cognitive impairments; as a result, families are the essential supporters of caring for them. Due to physical, mental, and emotional disabilities, patients usually depend on their

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Website: [www.ijnmrjournal.net](http://www.ijnmrjournal.net)

DOI: 10.4103/ijnmr.ijnmr\_26\_21

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**How to cite this article:** Pishkhani MK, Ebadi A, Dalvandi A, Aroogh MD, Vosoghi N, Ghorbanzadeh K. Psychometric properties of Persian version of the Bakas caregiving outcomes scale. Iran J Nurs Midwifery Res 2022;27:134-8.

**Submitted:** 08-Feb-2021. **Revised:** 02-Aug-2021.

**Accepted:** 11-Oct-2021. **Published:** 14-Mar-2022.

families for their daily living activities.<sup>[5,7,8]</sup> In this regard, most families are not adequately prepared and aware of home rehabilitation programs due to their unexpected exposure to the disease and assuming the role of caregiver at home.<sup>[8-10]</sup> On the other hand, long-term care for patients has a great negative impact on caregivers at home. Studies have shown that the prevalence of depression in caregivers of stroke patients (30%–33%) is higher than that of patients (23%–29%).<sup>[11]</sup>

In 2006, Bakas conducted a 15-item revised Bakas Outcomes Scale (BCOS) to measure life changes in caregivers of stroke patients resulting from providing care to patients. The BCOS is an appropriate and valuable scale that can be utilized to identify the devastating aspects of caregivers' lives resulting from caring for their patients. Good internal consistency reliability (Cronbach's  $\alpha$  0.75-0.90), construct validity, and stability have been demonstrated.<sup>[11,12]</sup> This scale was validated in other countries such as Turkey,<sup>[13]</sup> Greece,<sup>[14]</sup> and Brazil.<sup>[15]</sup> The use of this scale has been relevant to practice and research in various areas of health, including nursing.<sup>[15]</sup> In this regard, the existence of a reliable scale for assessing outcomes in caregivers of stroke patients in different communities can help to recognize and reduce caregivers' problems and improve the treatment outcomes of these patients. Therefore, the researchers decided to conduct this study to evaluate the psychometric properties of the Persian version of the Bakas Caregiving Outcomes Scale (BCOS) on Iranian caregivers of stroke patients.

## Materials and Methods

The present study is a methodological study conducted in Tehran and Rasht, Iran, from January to June 2018. The sample size was estimated according to the number of items in the tool. The minimum sample size to perform the exploratory analysis is 3 to 10 samples per item, although some believe that the minimum sample size in factor analysis is 200.<sup>[16]</sup> So, 200 family caregivers of stroke patients, who were referred to Rofeideh Rehabilitation Hospital in Tehran and the Physiotherapy Center of Poursina Hospital in Rasht according to the availability of the samples in these centers were selected. The inclusion criteria were as follows: 18 years or older, 4 months after stroke, willingness to participate in the study, and no physical disability namely hearing or speech impairment and psychological and cognitive disorders.

The Bakas Caregiving Outcome Scale (BCOS) that was used in this study was initially developed in 1994 to assess life changes in family caregivers of stroke survivors and later in 2005, it was revised to the attached 15-item version with psychometric study.<sup>[11,12]</sup> It has 19 items, 15 items with 7-point Likert responses (-3 to + 3), and 4 items with open responses. The numbers (+3 to -3) indicate the degree of change from -3 "changed for the worst" to + 3 "changed for the best." The number 0 means "no change."

In the translation process, after obtaining permission, steps of the WHO process of translation and adaptation of instruments were done.<sup>[17]</sup> The translation process from English to Persian was performed using the forward-backward method. First, the items were translated into the target language by two experts who had a good command of both languages. Afterward, two translators retranslated the items into the source language, i.e. English. The translated items were checked with the original items to ensure that the concepts had been successfully conveyed.

In order to evaluate the psychometric properties of the BCOS, the face, and content validity were performed qualitatively.<sup>[17]</sup> To verify face validity, the initial version of the scale was given to ten patient caregivers, and they read the scale and gave their opinion about the transparency and relevancy of the scale. Content validity was evaluated by the qualitative method. In the qualitative content validity, the ultimate Persian version of the scale was given to ten experts, and they were requested to check the grammar of the scale, using appropriate and correct words. After the required revisions were applied, the final Persian version of the BCOS was developed.

The Statistical analysis was performed using SPSS software version 18. Cronbach's alpha coefficient was used to measure the internal consistency of the BCOS, and Intraclass Correlation Coefficient (ICC) for the scale was calculated.

Construct validity of the scale was assessed using both exploratory and confirmatory factor analysis. In order to explore the factor structure of the scale, an exploratory factor analysis was performed. The Kaiser-Meyer-Olkin (KMO) and Bartlett's Test (BT) were performed to check sampling adequacy and data sphericity. The KMO index higher than 0.60 and significant Bartlett sphericity test results mean that it is possible to analyze the data using factor analysis. The scree plot and Promax rotation were used to extract the factors. Factor loading equal to 0.3 or above suggested that each item could be maintained in an extracted factor.<sup>[16]</sup> In order to confirm the factor structure of the BCOS, the Confirmatory Factor Analysis (CFA) was done. Maximum likelihood estimates helped test the CFA model. To assess the goodness-of-fit of the model, multiple criteria were used, including Root Mean Square Error of Approximation (RMSEA), Goodness of Fit Index (GFI), Adjusted Goodness of Fit Index (AGFI), Non-Normed Fit Index (NNFI), Normed Fit Index (NFI), Incremental Fit Index (IFI), and Comparative Fit Index (CFI). The LISREL 8.80 was used for the CFA. Table 1 shows the acceptable thresholds of the Fit Indices in the Confirmatory Factor Analysis Model.<sup>[18]</sup>

## Ethical considerations

The present study was approved by the Ethics Committee of the University of Social Welfare and Rehabilitation Sciences by the code IR.USWR.REC.1395. 157. Permission

from the designer of The Bakas Caregiving Outcome Scale (BCOS) was obtained by email. Before the study began, the participants were informed about the purpose and significance of the study, and informed consent was obtained from them. Additionally, the participants were assured of the confidentiality of their personal information during and after the study, and that their information would be only used for the purpose of the study. It was also explained that they had the right to withdraw from the study at any stage.

## Results

### Face and content validity

Face validity was assessed by ten patient caregivers, and opinions about relevancy and transparency of scale, in their view was that the scale was clear and relevant for them. In the qualitative content validity, the ultimate Persian version of the scale was given to ten experts, their recommendations about grammar, using appropriate and correct words, applying correct and proper order of words in items were given then the required revisions were applied, and the final Persian version of the BCOS was developed.

### Characteristics of the study samples

Totally, 191 family caregivers of stroke patients participated in the study. Of these, 130 (68.06%) were female, 128 (67.01%) were married, and the majority of them had an education level of secondary high school (57.60%). The majority of the participants (33%) were classified as middle-income individuals.

### Internal consistency and stability of the scale

Table 2 demonstrates the reliability of the scale with 14 items. Cronbach's alpha was 0.93. The test-retest reliability was conducted on 30 participants within a 2-week interval after the first time. The Intraclass Correlation Coefficient (ICC) for the total scores was stated at 0.94.

**Table 1: Acceptable thresholds of the fit indices in the confirmatory factor analysis model**

Fit Indices	Acceptable Rate	In this study
<i>p</i> -value	>0.05 >3.00	<0.001
Chi-squared/df		2.90
RMSEA*	Good <0.05	0.09
	Moderate <0.10	
CFI**	>0.90	0.97
NFI***	>0.90	0.95
AGFI****	>0.50	0.81
GFI*****	>0.90	0.86
SRMR*****	<0.10	0.04
PNFI*****	>0.50	0.79

\* Root Mean Square Error of Approximation, \*\* Comparative Fit Index, \*\*\* Normed Fit Index, \*\*\*\* Adjusted Goodness of Fit Index, \*\*\*\*\* Goodness of Fit Index, \*\*\*\*\* Standardized Root Mean square Residual, \*\*\*\*\* Parsimonious Normed Fit Index

### Exploratory factor analysis

The Kaiser–Meyer–Olkin (KMO) value for the data was 0.90, and the Bartlett's sphericity test results were satisfactory ( $p < 0.001$ ), suggesting the adequate sample size and acceptable distribution of the data for exploratory factor analysis. Therefore, factor analysis was performed, and two factors with an eigenvalue of 1 or greater were extracted that jointly provided the explanation for 57.27% observed variance. The range of factor loading was between 0.43 and 0.89. The results are shown in Table 3 and Figure 1. In exploratory factor analysis, item 13 did not fit into the model; therefore, it was omitted.

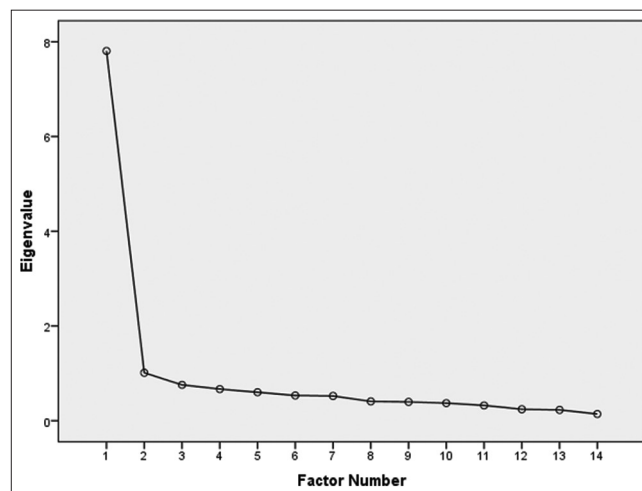
### Confirmatory factor analysis

Based on the CFA, the multiple criteria for the data were as follows: RMSEA = 0.098, CMIN/DF = 2.9, NFI = 0.95, NNFI = 0.96, PNFI = 0.79, CFI = 0.97, IFI = 0.97, RFI = 0.94, Standardized Root Mean square Residual (Standardized RMR) = 0.048, GFI = 0.86, AGFI = 0.81. The results showed, the model was fit at the predictable level with 14 items [Table 1]. In the model (without item 13), the standardized solution (*r*-value) and *t*-value, which show the relationship between the items and their factors, are given in Figure 2.

## Discussion

This study aimed to evaluate the psychometric properties of the Persian version of Bakas Caregiving Outcomes Scale (BCOS) in caregivers of stroke patients. Caregivers of stroke patients, as primary supporters, usually undertake patient care plans in homes, and patients depend on them for their daily activities.<sup>[5,6]</sup> The BCOS is a reliable and valid scale to evaluate the problems resulting from changes in the caregiver's life after stroke.<sup>[11]</sup>

In the present study, the internal consistency performed by Cronbach's alpha was 0.93. It was identical to the alpha of 0.90 from the BCOS original version in the reliability of



**Figure 1: Scree plot showing the eigenvalues of each of the extracted components**

scale.<sup>[11]</sup> In the two Greek and Brazilian validation studies, Cronbach's alpha was 0.83 and 0.89, respectively.<sup>[14,15]</sup> In addition to Cronbach's alpha, in the present study and these two studies, the test-retest reliability analysis was performed and showed good stability after 2 weeks.

Concerning the results of factor analysis in the present study in exploratory factor analysis, item 13 ("My relationship with stroke patient") was not entered into the model at all; therefore, item 13 was excluded. The plot diagram suggested two factors. Finally, two factors were selected in exploratory factor analysis; however, they could not be labeled as two separate factors. Then, confirmatory factor analysis was performed.

In confirmatory factor analysis, item 13 had a factor loading of less than 0.3. The literature indicated that the item with factor loading and item scale correlation <0.30 should be excluded from the scale.<sup>[19-21]</sup> Therefore, we excluded item 13, and the results showed that it fitted better. In the result of RMSEA, it was moderate, however, Goodness of Fit Statistics for other items was good and in the expected level.<sup>[22]</sup> Finally, the results of the confirmatory factor analysis of the translated version showed that the 14-item BCOS (without item 13) with two factors had good construct validity.

In the BCOS, Item 13 was related to the relationship between caregivers and stroke patients. Most caregivers need serious support to care for their patients, and they have

various physical and mental disorders resulting from caring for their patients.<sup>[8,9]</sup> They have numerous problems with patient care due to insufficient social and financial support, the lack of effective training and rehabilitation programs, the lack of access to rehabilitation services, and physical and psychological problems.<sup>[5,9]</sup> In Iranian culture and society, families are very supportive and have a good relationship with their patients; they try to help each other by maintaining each other's structure, function, and emotions.<sup>[5,7]</sup> In this study, caregivers stated that their relationship with the stroke patient had improved and changed positively after caring for them, and it may be the reason that it was not entered into the model.

Although, the results of the confirmatory factor analysis of the Persian version showed two factors, in the study by Bakas, the scale with a single factor was accepted in the confirmatory factor analysis.<sup>[11]</sup> In the Greek validation study

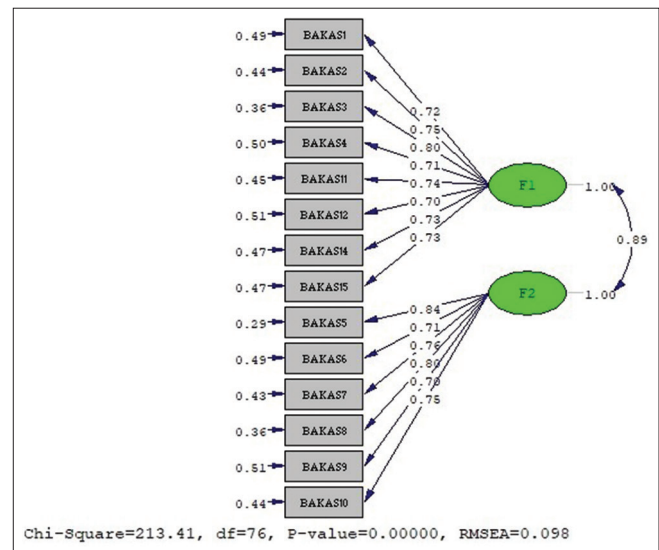


Figure 2: The final structure of the model with 14 Items

**Table 2: Cronbach's alpha coefficients for the total scale and dimensions**

Sub-scales	Number of items	Cronbach's alpha	ICC*
Factor 1	8	0.90	0.91
Factor 2	6	0.89	0.90
Total	14	0.93	0.94

\*Intraclass correlation coefficient

**Table 3: Factor analysis of the 14-items scale, extraction method: Maximum likelihood, and rotation method: Promax\***

Factors and Items	Factor Loading	Variance%	Eigenvalue
Factor 1		30.57	6.75
1. My self esteem	0.89		
12. My financial well-being	0.74		
14. My physical functioning	0.71		
4. My ability to cope with stress	0.62		
2. My physical health	0.59		
15. My general health	0.58		
11. My relationship with my family	0.57		
3. My time for family activities	0.47		
Factor 2		26.69	6.38
8. My emotional well-being	0.85		
10. My time for social activities with friends	0.82		
9. My roles in life	0.54		
5. My relationship with friends	0.53		
7. My level of energy	0.49		
6. My future outlook	0.43		

\* Kaiser-Meyer-Olkin measure of sampling adequacy=0.90, Bartlett's test of Sphericity was significant (p<0.001)



likewise, CFA reported an adequate fit for the suggested single-factor model,<sup>[14]</sup> and in the Brazilian version, factor and exploratory analysis developed a one-factor structure and was confirmed by confirmatory factor analysis.<sup>[14,15]</sup>

The studies show that BCOS is an appropriate and valuable scale that can identify the devastating aspects of caregivers' lives resulting from caring for their patients.<sup>[13-15]</sup> In this regard, the existence of a localized scale to assess outcomes in caregivers of stroke patients in different communities can help to reduce caregivers' problems. In this study, translation of the scale was performed carefully and based on the appropriate principles and steps adopted by the translation process, psychometric evaluation was performed by experts and careful observance of cultural conformity of meanings.<sup>[17-20]</sup> Face, content, and construct validity (exploratory and confirmatory factor analysis), and internal consistency were used to validate the scale. Internal consistency calculation (Cronbach's alpha) was used to estimate reliability.<sup>[19,20]</sup> The results of the test-retest indicated that the intra-class correlation coefficient was appropriate, and the reliability of this 14-item scale was confirmed in Iranian caregivers. The limitation of this study is both factor analyses was performed on one sample size.

## Conclusion

The findings of this study, which identified the most significant psychometric properties of the Persian version of the Bakas Caregiving Outcomes Scale, indicated satisfactory validity and reliability of the 14-item scale. It is recommended to use this version of the scale in related studies in Iranian caregivers of stroke patients.

## Acknowledgements

The present study was approved by the University of Social Welfare and Rehabilitation Sciences by the code 1144. We appreciate the Student Research Committee of the University of Social Welfare and Rehabilitation Sciences of Tehran. The researchers would like to express their gratitude and appreciation to all those who have contributed to the research.

## Financial support and sponsorship

The University of Social Welfare and Rehabilitation Sciences and the Student Research Committee of the University of Social Welfare and Rehabilitation Sciences

## Conflicts of interest

Nothing to declare.

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