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# Translation, Cultural Adaptation, and Psychometric Validation of the Persian Caregiver Empowerment Scale for Stroke Survivors for Use in Iran

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## Abstract

**Background:** Empowering family caregivers (FCGs) of stroke survivors can improve the quality of care they provide and reduce their stress levels. This study focused on translating, culturally adapting and testing the Persian version of Caregiver Empowerment Scale (CES) for FCGs of stroke survivors.

**Methods:** This methodological investigation was conducted in two large hospitals in Tehran, Iran, during the 2024–25 academic year. It comprised the following five steps: First, the CES was translated. Secondly, face validity was evaluated with 20 FCGs. Third, content validity was examined with ten experts. Fourthly, construct validity was assessed via exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) with 150 and 165 FCGs, respectively. Data analysis was performed using SPSS 26 and the lavaan package in R at a significance level of 0.05.

**Results:** After translating the CES into Persian, face validity confirmed that all items were clear and consistent, and none required removal. However, a quantitative content validity analysis led to the removal of items 28, 29 and 30 due to a low content validity ratio and index. EFA retained 25 items, which had loadings ranging from 0.438 to 0.918. Two items (1 and 19) were removed because their loadings were below 0.43. Four components were extracted — Personal, Social, Adaptive and Informational Self-Efficacy — explaining 80.66% of the total variance. Confirmatory factor analysis (CFA) confirmed the fit of the four-factor model (TLI = 0.903, df = 266, RMSEA = 0.077, SRMR = 0.065, CFI =

0.914). Cronbach's alpha, McDonald's omega coefficients and the intraclass correlation coefficient (ICC) were all above 0.90, indicating high reliability.

**Conclusions:** The findings showed that the Persian version of the 25-item CES for Stroke Survivors is both valid and reliable. This tool allows healthcare providers to evaluate the empowerment of FCGs and identify training requirements for targeted interventions.

**Keywords:** Caregivers, Stroke, Empowerment, Questionnaire, Psychometric, Translation, Persian

## Introduction

A stroke is usually a neurological disorder caused by a partial or complete interruption to the blood supply to the brain. This interruption is often due to obstructed blood flow (ischemic stroke) or bleeding from a ruptured cerebral blood vessel (hemorrhagic stroke) [1].

Stroke is a major global health problem [2]. It is an unpredictable event that can suddenly and severely disrupt a person’s life, resulting in death or disability [3]. According to the World Health Organization, it is the second leading cause of death and disability worldwide [4].Furthermore, more than 80% of stroke-related deaths occur in developing countries [5].

Survival rates and prognostic factors following stroke vary by region [6]. A large cohort study conducted in Australia and New Zealand between

2008 and 2017 found that survival probabilities were 79% at three months, 73% at one year, 53% at five years and 36% at ten years post-stroke. Stroke was associated with an average reduction in life expectancy of 5.5 years compared with the general population [7]. Similarly, a prospective cohort study in Tabriz, north-west Iran, reported a two-year post-stroke mortality rate of 38%. Mortality was substantially higher among patients with hemorrhagic stroke (58.7%) than among those with ischemic stroke (33.6%), and was significantly associated with older age, stroke subtype, diabetes mellitus and stroke severity [8].

As stroke often leads to acute impairments in perception, cognition and motor function, many survivors struggle to resume social, family or recreational activities. This necessitates long-term rehabilitation and comprehensive family support [9]. Following initial hospitalization, around 80% of stroke survivors return home, depending on FCGs to meet their physical and emotional needs [10]. FCGs, also known as informal caregivers, provide care for a relative with a chronic illness or disability [11].

"Despite their disabilities, most stroke survivors rely on family members for assistance with everyday activities such as bathing, dressing, and taking medication. Long-term impairments can compromise independence in these activities [12]. These caregivers perform complex tasks, often without compensation, including monitoring symptoms, ensuring treatment adherence, providing emotional support, coordinating care and addressing social and health needs [13-15]. Caregiving increasingly involves supervisory duties, emotional support, and coordination [16]. Therefore, it is essential to empower FCGs to manage daily activities, facilitate rehabilitation, and prevent complications [12]."

"In the Iranian social and cultural context, family members act as primary caregivers [17]. Due to the limited number of government-run rehabilitation centers, the scarcity of post-discharge support, and the high cost of private care, families assume the main responsibility for care [9, 18]. The absence of structured support and post-discharge training, coupled with the significant burden placed on FCGs, increases the risk of burnout. Therefore, it is essential to empower FCGs to manage daily activities, facilitate rehabilitation, and prevent complications [9, 12]."

Empowering FCGs involves enhancing their abilities and attitudes to manage caregiving effectively, including maintaining personal well-being, supporting care recipients, and fostering positive relationships [19]. A concept analysis of empowerment among FCGs of adults and the elderly, conducted using Rodgers' method [20], revealed four key components: positive control of the mind and body (the FCGs' ability to manage stress and maintain physical and psychological health); cultivation of positive feelings (developing optimism, resilience, and hopefulness in the caregiving role); proactive caregiving (actively engaging in caregiving tasks and seeking knowledge and strategies to improve care); and improvement in caregiving capabilities (enhancing the necessary skills and competencies to provide effective care). Empowerment also encompasses supporting the independence of the care recipient and facilitating their ability to perform daily activities autonomously and maintaining constructive relationships with others. This can be achieved by building supportive, collaborative relationships with family members, friends, and healthcare professional [20].

The empowerment of FCGs has recently received attention [21]. "Increasing caregiving knowledge and empowerment helps FCGs understand patients’ conditions, manage stress, and provide effective care [21-23]." "Given these positive effects, it is essential to measure caregiver empowerment" for evaluating interventions, identifying support needs, and improving long-term family outcomes [24, 25]."

Several assessment tools have been developed to measure and monitor the empowerment of FCGs. For instance, Koren et al. [26] created the Family Empowerment Scale to evaluate the empowerment of families with children experiencing emotional difficulties. This tool includes 34 items and three subscales: Family Empowerment, "Service System Empowerment" and Community/Political Empowerment. These assess empowerment within the family, interactions with service providers and engagement at the community or advocacy level, respectively. Sakanashi and Fujita [20] developed a similar tool called the Empowerment Scale for Family Caregivers of Community-Dwelling People with Dementia. This tool has 36 items and four subscales: Excellent Practice in Dementia Care, Understanding the Essence of Dementia Care, Caring for Oneself as Well as for the Person with Dementia, and Having Peers with Shared Support Activities. Another tool is the CES, which is suitable for assessing the empowerment of FCGs of patients with traumatic brain injuries. It includes 30 items organized into four factors: Advocacy Self-Efficacy, Community Self-Efficacy, Caregiver Self-Efficacy and Personal Self-Efficacy [27].

All of these instruments share the same objective: to measure FCGs' empowerment. The main differences lie in their target populations and the organization and number of items/subscales, reflecting the specific caregiving contexts for which each instrument was developed. Of the aforementioned tools, the CES is designed for use with FCGs of patients with traumatic brain injuries, and the reasons for this will be explained later. The other instruments were developed for specific groups, such as children with disabilities and people with dementia. In Iran, families are the primary support system for stroke survivors and play a key role in long-term caregiving [9]. The central role of FCGs in this context highlights the importance of assessing caregiver empowerment.

"In the caregiving context of Iran, where formal rehabilitation and home-care services are limited [9, 28, 29], FCGs assume primary responsibility for post-stroke care and perform a wide range of caregiving tasks [11, 15, 30]. Effective care therefore largely depends on the FCGs’ perceived ability to organize, manage and sustain long-term care independently."

"The CES was originally developed to assess the self-efficacy of FCGs of individuals with traumatic brain injuries, who face prolonged caregiving demands [27]. As caregiver self-efficacy should be evaluated across various settings and chronic conditions [31], and stroke and traumatic brain injury both require continuous supervision, care coordination and adaptation to persistent functional impairments, the CES is a potentially suitable tool for FCGs of stroke survivors. The scale's four domains — advocacy, community, caregiving, and personal efficacy — reflect the competencies required when FCGs act as primary managers of long-term care. It remains to be determined whether all these domains are equally applicable to the Iranian context, but this research can provide empirical evidence on the cultural relevance of each dimension."

The present study aimed to translate the CES into Persian and evaluate its psychometric properties for FCGs of stroke survivors. The main research question was whether the Persian version of the CES could accurately and effectively measure the empowerment of this population's FCGs.

## Methods

### Study design

This methodological study was conducted between December 2024 and March 2025. The timing of ethical approval and the availability of eligible FCGs at the participating centers determined the data collection period. The translation, cultural adaptation and psychometric testing of the original English CES for FCGs of stroke survivors involved five standard steps: (1) translation; (2) face validity; (3) content validity; (4) construct validity, as assessed by EFA and CFA; and (5) internal consistency [32].

### Caregiver Empowerment Scale (CES)

"The 30-item version of the CES, developed by Degeneffe et al., was used to assess the sense of empowerment experienced by FCGs of individuals with traumatic brain injury in the United States." The instrument includes four subscales: Advocacy Self-Efficacy (items 28 and 29); Community Self-Efficacy (items 6, 8, 12, 13 and 27); Caregiver Self-Efficacy (items 2, 3, 7, 14, 18, 22 and 30); and Personal Self-Efficacy (items 1, 4, 9, 10, 11, 15, 16, 17, 19, 20, 21, 23 and 25). Each item is rated on a five-point Likert scale ranging from 'very low ability' to 'very high ability' (1 = very low ability; 2 = low ability; 3 = moderate ability; 4 = high ability; 5 = very high ability). The validity of the CES was evaluated through convergent and discriminant item analyses, as well as correlations with family well-being indicators. These analyses demonstrated that the subscales represent distinct constructs and meet psychometric criteria. The instrument's reliability was confirmed by Cronbach's alpha coefficients ranging from 0.76 to 0.92, indicating acceptable internal consistency [27].

### Step 1: Forward and backward translation

The translation and cultural adaptation of the CES were conducted in accordance with the WHO Translation and Linguistic Evaluation Protocol [33]. First, written formal permission to use the CES was obtained from the original designer. Then, the translation process began. Two independent translators fluent in English first translated the original English version of the CES into Persian. Both translators had prior experience of translating academic texts, including healthcare-related questionnaires. The research team then reviewed the two forward translations, resolving any discrepancies in wording, clarity and cultural relevance by reaching a consensus. Finally, the corresponding and first authors prepared a final, unified version in Persian by carefully reviewing and comparing the two translations.

In the next phase, two translators who were not involved in the initial stage and were unaware of the original content performed the back-translation process, translating the Persian version back into English. These translators also had experience of translating scientific and clinical materials. Minor differences in phrasing were identified and corrected between the back-translated versions and the original CES to ensure conceptual equivalence. These differences were primarily related to word choice and sentence structure rather than meaning. The suitability of the questionnaire for Persian-speaking FCGs was judged by the translators based on semantic accuracy, conceptual fidelity, and clarity. The retranslated versions were then compared with the original English version and any differences examined in terms of their conceptual and linguistic aspects. Finally, the revised Persian version of the instrument was sent to the designer for evaluation and approval of its conceptual accuracy and linguistic correctness. Following translation and approval, the Persian version proceeded to examination of its psychometric properties, including face and content validity, reliability (internal consistency and stability), and construct validity.

**Step 2: Face validity**

The scale's face validity was assessed in two phases: a qualitative phase and a quantitative phase. During the qualitative phase, the instrument was administered to 20 FCGs of stroke survivors. Participants were asked to evaluate the CES in terms of its readability, clarity, level of difficulty, ease of understanding, complexity of items, and ambiguous terminology.

During the quantitative phase, the same participants were asked to rate the importance and comprehensibility of each item using a five-point Likert scale ranging from 'not at all comprehensible' (score 1) to 'completely comprehensible' (score 5). The impact score of each item was then calculated using the following formula:

$$\text{Impact Score} = \text{Frequency (\%)} \times \text{Importance}$$

'Frequency' indicates the percentage of participants who gave each item a score of 4 or 5, and 'Importance' represents the mean score for each item on the Likert scale. Items with an impact score greater than 1.5 were retained [34].

### Step 3: Content validity

The CES was systematically assessed for content validity in two phases: a qualitative phase and a quantitative phase. "The expert panel responsible for the qualitative assessment comprised ten nursing faculty members. This panel comprised five members: four nursing faculty members specializing in caregiving research, psychometrics, and questionnaire evaluation; and one professional translator with experience in healthcare and clinical questionnaire translation. Each faculty member had several years of relevant academic and research experience."

They were asked to comment on grammar, vocabulary, conceptual clarity and sentence fluency. The suggested corrections were then incorporated into the final version to enhance the quality of the content.

In the second step, the quantitative content validity was assessed using two indices: the Content Validity Ratio (CVR) and the Content Validity Index (CVI). The CVR was calculated by asking ten faculty members to review the scale and rate the necessity of each item on a three-point Likert scale (1 = unnecessary; 2 = useful but not necessary; 3 = necessary). The CVR for each item was then calculated using the following formula:

$$CVR = (Ne – N/2) / N/2$$

In this formula, Ne represents the number of experts who rated the item as 'necessary', and N represents the total number of experts who participated in the assessment. According to Lawshe's table, the minimum acceptable CVR value for ten experts is 0.62. Items with scores above this threshold were considered valid. [35].

The CVI was used to evaluate the relevance and suitability of the CES items for the purpose of the instrument. Each item was rated by ten nursing faculty members on a four-point Likert scale ranging from “irrelevant” (score 1) to “completely relevant” (score 4). The CVI was then calculated for each item. According to the established criteria, a CVI value of over 0.79 indicates that the content is valid. Values between 0.70 and

0.79 require the item to be revised, and values below 0.70 indicate that the item should be removed. Consequently, only items with sufficient expert ratings were included in the final version of the questionnaire [36].

### Step 4: Construct Validity

The construct validity of the CES was examined in two phases: EFA and CFA.

### Data collection and participants for construct validity

"To assess construct validity, data were collected from 315 FCGs of stroke survivors using a convenience sample from two public, university-affiliated hospitals in Tehran, Iran: Shohada Tajrish Hospital and Imam Hossein Hospital. Both hospitals are affiliated with Shahid Beheshti University of Medical Sciences. Shohada Tajrish Hospital is located in northern Tehran, while Imam Hossein Hospital is in central Tehran."

"These hospitals serve as major referral centers for neurological and stroke patients at university, city and national levels, which justifies their selection. Each hospital provides comprehensive inpatient and paraclinical services, including neurology and intensive care units (ICU/CCU), dialysis services, and rehabilitation services such as physical and occupational therapy. They also offer radiotherapy alongside multiple medical and surgical specialties. The neurology wards have 20 beds at Shohada Tajrish Hospital and 30 beds at Imam Hossein Hospital. Sampling was carried out in the neurology inpatient wards of both hospitals."

A total of 150 participants took part in the EFA and 165 in the CFA. The EFA sample provided a ratio of approximately 5.5 participants per item for the 27 items, which falls within the recommended range of five to ten. The CFA was conducted after the EFA to confirm the factor structure identified in the exploratory phase. According to established guidelines recommending a minimum of 100–200 cases or 5–10 participants per estimated parameter, the sample size of 165 participants was appropriate for the CFA. Given the moderate number of items, the relatively simple model structure and the adequate parameter estimates, this sample size was sufficient for reliable parameter estimation and model fit evaluation [37].

"The inclusion criteria for stroke survivors were a confirmed stroke diagnosis based on medical records. For FCGs, the inclusion criteria were: being aged 18 years or over; being literate; being a first- or second-degree relative of the patient; and being responsible for the direct care of the stroke survivor." Eligible stroke survivors were first identified through a review of their medical records. Their FCGs were then approached if they met the eligibility criteria. All eligible FCGs were invited to participate.

After visiting the internal medicine departments of the two aforementioned hospitals, the first author identified FCGs who met the inclusion criteria. The FCGs were approached in person at the patient's bedside during their hospitalization. They were then given a full explanation of the study, its purpose and its procedures. If they agreed to participate, the researchers distributed the questionnaires and collected them once they had been completed. Approximately 7% of eligible FCGs declined to participate, and recruitment continued until the target sample size was reached. All questionnaires were completed in paper format. Completion took around five minutes, and the first author was present to provide clarification when necessary.

## Instruments

### *Demographic Information Questionnaire*

This questionnaire contained a total of 12 questions. Five of these were about the patients' demographic characteristics, such as age, gender, marital status, type of stroke and how long they had been ill for. The remaining seven questions were about the demographic characteristics of the FCGs, including their age, gender, marital status, perceived income adequacy, educational level, relationship to the patient, and caregiving role within the family.

### *Caregiver Empowerment Scale (CES)*

As previously mentioned, the CES is a validated instrument designed to measure FCG empowerment. In this study, data from the CES were used to evaluate construct validity.

## Exploratory factor analysis (EFA)

An EFA was conducted to examine the factor structure of the Persian version of the CES. Principal component analysis (PCA) with Promax oblique rotation was then used to investigate the scale's underlying factor structure and to make it easier to interpret correlated factors. PCA was chosen because it is a robust and widely accepted method of preliminary data reduction and identification of structure in psychometric research, particularly during the early stages of validation [38].

To assess sampling adequacy, Kaiser-Meyer-Olkin (KMO) and Bartlett's tests were conducted. For EFA, a KMO value close to 1 is preferable, though a score above 0.4 is generally considered acceptable. Ideally, the score should be above 0.7. The Bartlett's test p-value should be less than 0.05 [39]. "Data analysis was performed using SPSS (version 26; IBM Corp., Armonk, NY, USA)."

## Confirmatory factor analysis (CFA)

Several indices were used to assess the quality and fit of the model, including chi-square, the comparative fit index (CFI) [40], the Tucker–Lewis index (TLI) [41], the root mean square error of approximation (RMSEA) [42], and the standardized root mean square residual (SRMR)[43]. Acceptable fit is indicated by TLI and CFI values >0.90, while values >0.95 indicate an excellent fit [43]. For SRMR, values below 0.08 are generally considered to be indicative of an acceptable model fit [43]. The RMSEA is considered acceptable when <0.08 and good when <0.05 [44].

There was no missing data in the study; any incomplete questionnaires were excluded from the analysis. Prior to the CFA, the multivariate normality of the data was assessed using Mardia’s test, as well as by examining skewness and kurtosis. This confirmed that the assumption was adequately met. The robustness of the results was then ensured using maximum likelihood estimation in lavaan.

No residual covariances or other modifications were applied to the CFA model beyond the hypothesized factor structure, ensuring that the model remained theory-driven. The CFA model included 64 estimated parameters, giving a sample-to-parameter ratio of around 2.6:1. Despite this moderate ratio, the model's relatively simple structure and the adequacy of the parameter estimates suggest that the sample size was sufficient for reliable estimation of the model and evaluation of its fit [37].

### Step 5: Reliability

To measure the reliability of the CES, Cronbach's alpha and the test-retest method were employed. To examine stability, the instrument was administered to 20 FCGs of stroke survivors at two-week intervals. The ICC was then calculated for the total scale and for each item to assess stability and agreement.

To evaluate the internal consistency and reliability of the CES, we calculated Cronbach’s alpha [45] and McDonald’s omega [46], which are complementary measures of reliability. Cronbach’s alpha is the traditional measure of internal consistency and indicates how consistently the items correlate with each other. In contrast, McDonald's omega accounts for differences in each item's contribution to the overall construct, providing a more accurate estimate when factor loadings vary across items.

"Known-group validity assesses whether a measurement tool can distinguish between groups that are expected to exhibit differences in the construct being measured. In the CES, total and subscale scores were compared across demographic and caregiving groups using independent-samples t-tests for variables with two categories and one-way ANOVA for variables with more than two categories. Effect sizes were calculated using Cohen's d for t-tests and Eta Squared for ANOVAs. A p-value of less than 0.05 was considered statistically significant."

## Results

### Participants' socio-demographic and clinical status

All 315 FCGs completed the study, and no participants were lost to follow-up. The majority of FCGs were female (n = 237; 75%) and had a mean age of 26.46 ± 13.18 years. The majority of stroke survivors were male (n = 171; 54%) and had a mean age of 64.68 ± 14.83 years. The average hospital stay for patients was 38.14 ± 15.00 days.

Additional demographic and clinical characteristics of both stroke survivors and their FCGs are summarized in Table 1.

### Steps 1-4: Translations, Face and content validity

In the first phase, the initial Persian version of the CES was prepared using forward and backward translation, and was then approved by the original designer. A qualitative face validity assessment was then conducted with

20 FCGs of stroke survivors. The participants reported that all items were clear, simple and relevant to the study topic, and that the wording and structure were understandable. In the quantitative face validity assessment, all items obtained an impact score of over 1.5 and none were removed.

Minor revisions were made to the wording, writing quality and conceptual clarity of the items in the qualitative content validity assessment. The final version was subsequently approved by the expert panel. The experts independently reviewed the instrument, evaluating its conceptual clarity, cultural appropriateness, linguistic accuracy, and relevance to the caregiving context of FCGs of stroke survivors.

The researchers conducted a quantitative content validity assessment and removed items 28, 29 and 30 from the final translated version, as their CVR and CVI values were both below the established threshold of 0.62 and 0.70 respectively. These items addressed socio-political participation, influencing the political system and selecting appropriate healthcare and rehabilitation providers. They were also deemed culturally irrelevant within the Iranian social and healthcare context, given that political participation, policy influence and systemic advocacy are not generally considered the responsibility of FCGs. Consequently, the remaining 27 items were retained for construct validity analysis.

## Step 4: Construct validity

### *Exploratory factor analysis*

In the EFA, the KMO value was 0.923 and Bartlett's test of sphericity was significant ($\chi^2 = 6{,}260.417$, df = 351, $p < 0.001$), suggesting that the sample size was sufficient for factor analysis. The EFA results showed that the four-factor structure explained 66.8% of the total variance. The scree plot also supported retaining these four factors (see Figure 1).

In this revision, the number of items in the Personal Self-Efficacy factor was reduced from 16 to 10. Items 1 (I have good coping skills) and 19 (I have spiritual beliefs) were removed due to factor loadings below 0.43. Item 15 was reassigned to the Social Self-Efficacy factor and items 9, 16 and 23 were reassigned to a newly identified factor: Adaptive Self-Efficacy. This factor was subsequently conceptualized as 'Personal Self-Efficacy', reflecting the FCGs’s beliefs and skills in managing personal needs and self-care.

The Social Self-Efficacy factor originally consisted of five items, increasing to seven following the reassignment of items 7 and 15 from Caregiver Self-Efficacy and Personal Self-Efficacy, respectively. This factor represents the FCGs’ ability to establish and maintain social relationships, and utilize formal and informal community support.

The Caregiver Self-Efficacy factor underwent substantial modifications in the revised version. In the original scale, this factor comprised seven items. Item 30 was removed to ensure content validity, and items 2 and 3 were reassigned to the Informational Self-Efficacy factor. Item 7 was also reassigned, this time to the Social Self-Efficacy factor. The remaining items in this factor were items 14, 18 and 22.

Items 9, 16 and 23 were then reassigned from the Personal Self-Efficacy factor to form a newly identified factor: Adaptive Self-Efficacy. This new factor reflects the FCGs’ psychological and behavioral adaptation to the caregiving role, including their ability to manage caregiving-related stressors and maintain life balance.

Finally, during this phase, the Advocacy Self-Efficacy factor was restructured by incorporating items 2 and 3 (which had been reassigned from the Caregiver Self-Efficacy factor) to form a new factor, Informational Self-Efficacy. The original Advocacy factor was removed during the content validity phase, after items 28 and 29 were deleted. "The Informational Self-Efficacy, a new factor, reflects FCGs’ confidence in identifying the ongoing care needs of stroke survivors and recognizing their own emotional challenges, such as depression and anxiety. This subscale captures the ability to monitor both patient care requirements and personal emotional well-being, both of which are essential for effective caregiving and informed decision-making."

Following these modifications, the results showed that the factor loadings of the retained items varied between 0.43 and 0.91 (see Table 2). All items demonstrated acceptable communalities, suggesting that each item adequately contributes to its respective factor. These findings support the adequacy of the revised factor structure.

Revising the CES improved its conceptual coherence, psychometric robustness and content validity for use with FCGs of stroke survivors.

### ***Confirmatory factor analysis***

A CFA was conducted to evaluate the fit of the hypothesized four-factor model to the observed data. This analysis was performed using the lavaan package in the R statistical environment. The original model, based on the proposed four-factor structure, was assessed using standard model-fit indices. The results indicated that the initial model did not fit the data well. Therefore, theoretically justified refinements were considered.

These modifications involved specifying the covariances between the measurement errors of items 12 and 13, 14 and 18, and 4 and 5, since these items are conceptually related. Items 4 and 5, for example, address FCGs' awareness of and ability to express emotions; items 12 and 13 pertain to acquiring practical support and training; and items 14 and 18 involve motivating FCGs to participate in activities. The covariances were only specified between items loading on the same latent factor, and were theoretically justified based on shared content, overlapping wording and measurement overlap rather than being data-driven modifications. This approach is acceptable in structural equation modelling as it does not alter the underlying factor structure.

Following these changes, the modified model showed significant improvements in fit indices while confirming the original four-factor structure (see Table 3 and Figure 2). As shown in Table 3, the RMSEA of the modified model (0.077) falls within the acceptable range, indicating adequate model fit. However, it is near the upper threshold, which is likely due to the complexity of the four-factor structure.

### Step 5: Reliability

The scale demonstrated strong internal consistency, with both Cronbach’s alpha and McDonald’s omega coefficients equaling 0.94. These findings suggest that the scale reliably and coherently measures the intended construct. While the reliability coefficients were high, the moderate number of items and their distribution across four distinct factors suggest that these values reflect construct homogeneity rather than redundant items.

Additionally, the ICC for the total score between pre-test and post-test was 0.945, indicating excellent temporal stability of the scale. These results support the reliability of the instrument over time (see Table 4).

"A known-groups comparison analysis (see Table 5) revealed that, among stroke survivors, gender, marital status and stroke type were significantly associated with personal, social and adaptive self-efficacy ($p < 0.05$). However, the effect sizes were small (Cohen's d = 0.21–0.33; $\eta^2 = 0.035$–0.044), suggesting a limited practical impact. Among FCGs, education and income adequacy had the greatest impact on self-efficacy ($\eta^2 \approx 0.07$–0.12), with higher educational and financial resources being associated with higher levels of personal, social and adaptive self-efficacy. Other variables (gender, marital status, relationship to patient, family position) had small effects, suggesting limited influence."

"These findings confirm that the CES is a reliable tool in the Iranian context for identifying meaningful differences in FCGs’ empowerment. The ‘CES-Stroke Survivors’ Version’ is presented in Table 6 and Supplement 1."

## Discussion

The present study demonstrates that the Persian version of the CES effectively captures the multidimensional nature of empowerment among Iranian FCGs of stroke survivors. Validity assessments, including evaluations of face, content and construct, confirmed that the adapted items accurately reflect the experiences of FCGs and are culturally appropriate. The four-factor structure — Personal, Social, Adaptive and Informational Self-Efficacy — aligns with the competencies required of FCGs serving as primary managers of long-term post-stroke care.

These findings are consistent with previous research emphasizing that instruments developed in one cultural context require systematic adaptation before they can be used in another [47]. Unlike several prior studies in related caregiving populations, which did not assess face or content validity, this study highlights the importance of these steps in ensuring the clarity, relevance and applicability of the scale [20, 26, 27, 47]. The results provide a solid foundation for subsequent psychometric evaluations, including construct validity and reliability testing, and demonstrate that this culturally adapted tool is appropriate for the target population.

As mentioned in the 'Results' section, items 28, 29 and 30 were removed from the CES-Stroke Survivors' Version because their CVR and CVI values did not reach the required thresholds. These items were also deemed culturally inappropriate as, in the Iranian social and healthcare context, political participation, policy influence and systemic or legal advocacy are not typically the responsibility of FCGs. The limited availability of services outside hospital settings, the lack of clarity surrounding relevant laws, and the absence of formal channels for citizen requests further emphasize the need for careful cultural adaptation, highlighting the structural and cultural differences between this context and that in which the original CES was developed.

As previously noted, items 1 and 19 were removed from the CES-Stroke Survivors' Version. EFA identified 25 items across four factors, which were subsequently confirmed by CFA. The Personal Self-Efficacy factor represents FCGs’ skills and beliefs in managing their own needs, while the Social Self-Efficacy factor reflects their ability to maintain social connections and utilize available support. The Caregiver Self-Efficacy factor was reorganized and a new Adaptive Self-Efficacy factor was introduced to capture FCGs’ psychological and behavioral adaptation to the caregiving role.

The Advocacy Self-Efficacy factor, which in the original CES reflects FCGs’ engagement with formal service systems and policy-related actions [27], was removed from the present study. Several of its items were reassigned to an informational self-efficacy factor, consistent with prior reports that empowerment dimensions may function differently across cultural contexts [22, 47]. This modification reflects the practical, knowledge-focused role of FCGs in the Iranian context.

These modifications strengthened the overall factor structure, which now explains 66.8% of the total variance — a higher figure than that reported in comparable studies, such as those by Koren et al. [24] (52%) and Sakanashi and Fujita[20] (52.09%). This improvement likely reflects the structural modifications and cultural adaptation of the scale for Iranian FCGs. Furthermore, Kageyama et al. [24] and Degeneffe et al. [27] did not report the explained variance, which highlights the four-factor model's enhanced explanatory power and conceptual clarity.

CFA confirmed that the four-factor model identified in EFA was a good fit for the data, thus supporting the conceptual structure of the Persian CES-Stroke Survivors' Version. Unlike the original American version [27] and other related scales [20, 24, 25, 48, 49] which did not perform CFA, this study provides stronger construct validation. Previous research on FCGs of people with dementia identified different empowerment dimensions [47] which may not fully represent the experiences of FCGs of stroke survivors.

Overall, the findings suggest that the adapted Persian version of the CES for stroke survivors demonstrates sound structural integrity and practical applicability within the Iranian caregiving context. The cultural modifications improved conceptual clarity while maintaining psychometric robustness. To strengthen generalizability, future research should evaluate the model using independent and longitudinal samples, and examine measurement invariance across key demographic groups.

The Persian version of the CES for stroke survivors demonstrated adequate reliability, including stability over time and internal consistency.

Unlike the original English version, which only reported subscale Cronbach's alpha values [27], this study provides a more comprehensive assessment of reliability. Comparable studies have also reported satisfactory reliability: Kageyama et al. [24] found acceptable Cronbach's alpha and ICC values for the Family Empowerment Scale for FCGs of adults with mental health issues. Koren et al. [26] reported similar reliability for families with children experiencing emotional difficulties. In contrast, the empowerment scale for FCGs of community-dwelling people with dementia showed lower ICC values, indicating reduced stability over time [20]. Overall, these findings suggest that the Persian CES-Stroke Survivors’ Version is a reliable instrument.

"This study introduces a culturally and linguistically adapted instrument designed specifically to assess the empowerment of FCGs of stroke survivors in Iran. The CES-Stroke Survivors' Version has strong psychometric properties, including content, construct and reliability validity, and provides a practical tool for evaluating FCGs empowerment. The development of this instrument fills a significant gap in Iranian literature and paves the way for future research and interventions that address the needs and strengths of this FCGs population."

"While the revised scale captures key dimensions of FCGs empowerment, it may not fully represent certain culturally and contextually relevant aspects, such as psychological and emotional self-efficacy, adaptive coping skills, and resilience. These aspects should be explored in future studies. While the findings emphasize the strengths and practical applicability of the CES-Stroke Survivors’ Version, several limitations of the study should also be considered."

### Study Limitations

"This study has several limitations. Firstly, the sample was drawn using convenience sampling, so caution should be exercised when generalizing the findings to other populations. Secondly, due to cultural differences between countries, future studies should translate and evaluate the scale in other languages. Although the translation was carefully carried out by experts and adapted to the culture, the resulting version may not fully capture all nuances across Iran’s diverse Persian-speaking population.

Another limitation is that most of the participants were female, which may have influenced the results. Furthermore, the study did not examine external validity or relationships with other constructs. Convergent and discriminant validity analyses were not performed either, and future research should address these psychometric aspects to strengthen the instrument’s evaluation further.

## Conclusion

According to validity and reliability assessments, the Persian version of the CES adapted for FCGs of stroke survivors is valid and reliable. It demonstrated favorable psychometric properties, including face, content and construct validity, as well as satisfactory reliability, as confirmed by exploratory and confirmatory factor analyses.

Despite some items being removed during the adaptation process, the Persian version retained strong psychometric properties, thus supporting its continued use in clinical and research settings."

## Future Recommendations and Clinical Implications

"The Persian version of the CES for stroke survivors can be used in clinical, educational and home care settings to assess the empowerment of FCGs of stroke survivors. It enables healthcare professionals, including nurses, occupational therapists, rehabilitation specialists and policymakers, to identify FCGs’ strengths and unmet needs in a structured way. This could help to develop targeted educational and supportive interventions to improve care management skills, adaptive coping strategies and access to social support. This could potentially reduce FCGs burden and enhance patient outcome [12, 19, 50].

Due to its demonstrated validity and reliability, the instrument could also be employed in future interventional and longitudinal research to evaluate changes in FCGs empowerment over time. Further studies should examine the factor structure in independent samples and assess measurement invariance across gender, age, and caregiving duration to strengthen generalizability. Additionally, cross-cultural validation in other linguistic and healthcare contexts is recommended. Taking these steps would enhance the robustness of the instrument and contribute to advancing family-centered stroke care and support systems [20, 27, 51]."

## Abbreviations

CFA – Confirmatory Factor Analysis
CFI – Comparative Fit Index
CES – Caregiver Empowerment Scale
CVI – Content Validity Index
CVR – Content Validity Ratio
EFA – Exploratory Factor Analysis
FCGs – Family Caregivers
ICC – Intraclass Correlation Coefficient
KMO – Kaiser-Meyer-Olkin
PCA- Principal Component Analysis
RMSEA – Root Mean Square Error of Approximation
SRMR – Standardized Root Mean Square Residual
TLI – Tucker-Lewis Index

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## Author’s contributions

P.V. and K.P. designed the study; K.P. collected the data; and M.F. analyzed the data. As well, K.P. authored the manuscript, and P.V. and M.F. reviewed the manuscript. All authors approved the manuscript.

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## Data availability

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

## Declarations

### Ethics approval and consent to participate

All the measures taken in this study were approved by the Ethics Committee of Shahid Beheshti University of Medical Sciences, Tehran, Iran (code no. IR.SBMU.PHARMACY.REC.1403.187) in agreement with the ethical standards of the 1964 Declaration of Helsinki and its later amendments. Informed consent was also obtained from all participants.

### Consent for publication

This work does not contain any individual person’s data in any form (including any individual details, images, or videos).

### Competing interests

The authors declare no competing interests.

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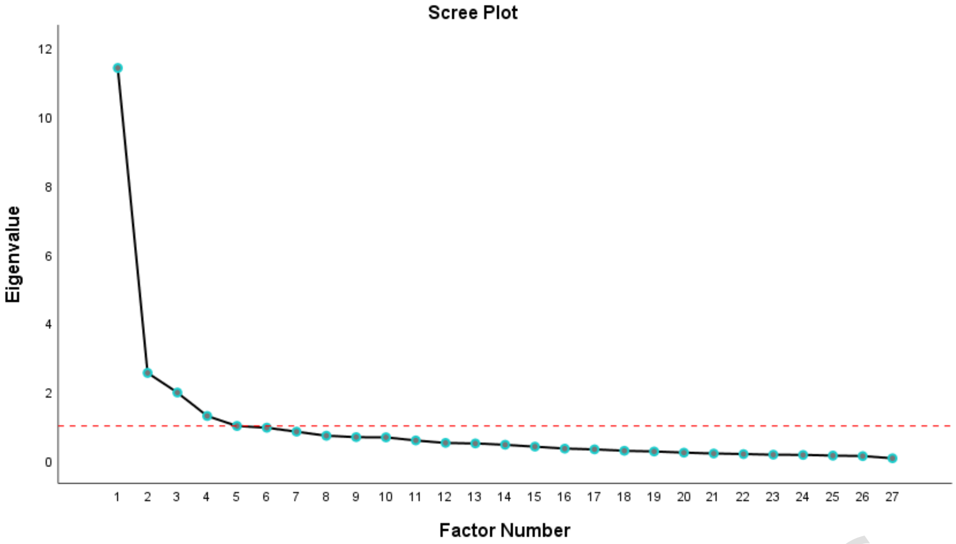

**Fig1- Scree plot of factors**

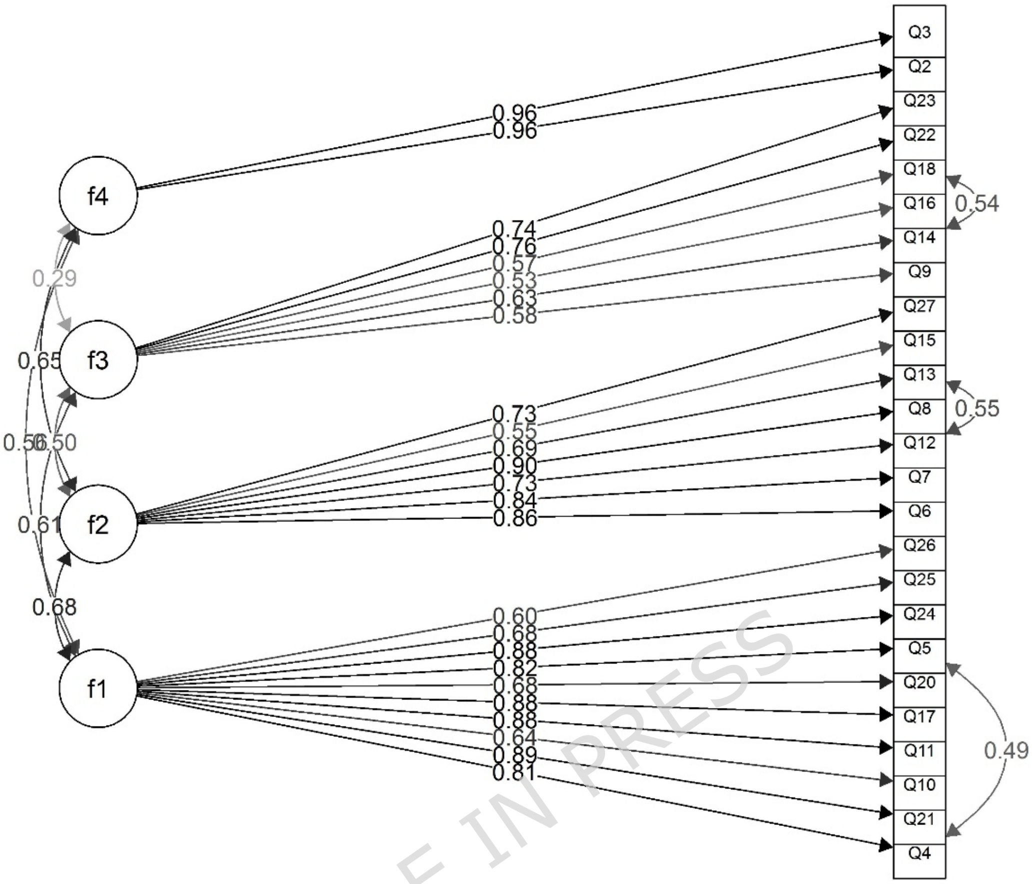

Fig 2- Modified model

**Table 1: Participants’ Demographic and clinical information (N=315)**

| | Variables | N | % |
|---|---|---|---|
| **Stroke Survivors** | ***Gender*** | | |
| | Female | 144 | 45.7 |
| | Male | 171 | 54.3 |
| | ***Marital status*** | | |
| | Married | 156 | 49.5 |
| | Single | 18 | 5.7 |
| | Widow | 124 | 39.4 |
| | Divorced | 17 | 5.4 |
| | ***Types of stroke*** | | |
| | Ischemic | 263 | 83.5 |
| | Hemorrhagic | 52 | 16.5 |
| **FCGs** | ***Gender*** | | |
| | Female | 237 | 75.2 |
| | Male | 78 | 24.8 |
| | ***Education level*** | | |
| | Illiterate [a] | 4 | 1.3 |
| | Primary school | 13 | 4.1 |
| | Middle school | 42 | 13.3 |
| | High school and diploma | 143 | 54.4 |
| | Academic [b] | 113 | 35.9 |
| | ***Marital status*** | | |
| | Married | 222 | 70.5 |
| | Single | 79 | 25.1 |
| | Widow | 5 | 1.61 |
| | Divorced | 9 | 2.9 |
| | ***Income adequacy*** [c] | | |
| | Enough | 70 | 22.2 |
| | Insufficient | 184 | 58.4 |

| | | |
|---|---|---|
| Somewhat sufficient | 61 | 19.4 |
| ***Relationship to stroke survivors*** | | |
| Spouse | 54 | 17.1 |
| Child | 195 | 61.9 |
| Sister/ Brother | 30 | 9.5 |
| Father or mother | 5 | 1.6 |
| Friends and other family members | 31 | 9.8 |
| ***Caregiver's position in their own family*** | | |
| Mother | 176 | 55.9 |
| Father | 41 | 13 |
| It doesn't apply [d] | 84 | 26.7 |
| Other [e] | 14 | 4.4 |

*a* Illiterate, *b* Higher than high-school diploma, *c* Perceived sufficient income to cover expenses, *d* No parental or sibling role in own family (may live alone), *e* Parent, spouse, or sibling role in own family

*FCGs*: family caregivers

**Table 2- The results of EFA**

| Items | Factor Loading% | | | | Variance |
|---|---|---|---|---|---|
| | Factor1 (Personal Self-Efficacy) | Factor2 (Social Self-Efficacy) | Factor3 (Adaptive Self-Efficacy) | Factor4 (Informational Self-Efficacy) | |
| Q21: I know how to maintain a positive outlook about life. | 0.907 | | | | 44.77 |
| Q5: I know how to express my feelings. | 0.887 | | | | |
| Q11: I know how to deal with negative emotions | 0.869 | | | | |
| Q4: I know when I am experiencing emotional difficulties (e.g., depression and anxiety). | 0.846 | | | | |
| Q24: I know how to express my feelings and frustration. | 0.825 | | | | |
| Q20: I know how to find times to attend to my personal needs. | 0.726 | | | | |
| Q17: I know how to think positively. | 0.723 | | | | |
| Q25: I know how to reward myself for a job well done. | 0.665 | | | | |
| Q10: I know when to rest and regain energy. | 0.639 | | | | |
| Q26: I know how to establish a support network for myself. | 0.438 | | | | |
| Q6: I am knowledgeable of rehabilitation services in the community (e.g., vocational rehabilitation, independent living, and respite | | 0.839 | | | |

| | | | |
|---|---|---|---|
| care). | | | |
| Q12: I know how to apply for government benefits related to the support of the family member. | 0.835 | | 9.74 |
| Q13: I know how to obtain training from professionals to better care for the family member. | 0.834 | | |
| Q8: I know how to access community support and resources. | 0.804 | | |
| Q7: I have a good sense of the rehabilitation potential (i.e., work and independent living potential) of the family member | 0.722 | | |
| Q27: I know how to obtain legal help for the family member. | 0.634 | | |
| Q15: I can deal with the financial hardships. | 0.491 | | |
| Q16: I am fine with the personal sacrifices I have to make. | | 0.753 | 7.8 |
| Q14: I know how to motivate the family member to participate in community integration activities (e.g., attend a social support group). | | 0.747 | |
| Q9: I can handle frustration related to negotiating services for the family member. | | 0.624 | |
| Q18: I know how to motivate the family member to participate in recreational activities | | 0.620 | |
| Q22: I can modify my expectations about the rehabilitation of the family member. | | 0.530 | |
| Q23: I know how to change my life role to adapt | | 0.513 | |

| | | | | | |
|---|---|---|---|---|---|
| to the need of the family member. | | | | | 4.49 |
| Q2: I know what can be done and cannot be done for the family member with brain injury. | | | | 0.918 | |
| Q3: I know the ongoing care needs of the family member. | | | | 0.828 | |
| Cumulative% | 44.77 | 54.51 | 62.31 | 66.8 | |

*EFA*: exploratory factor analysis

**Table 3- Model fit indices for initial and modified models**

| Model | Indices | | | | | |
|---|---|---|---|---|---|---|
| | $\chi^2$ | df | CFI | TLI | RMSEA (0.95%CI) | SRMR |
| Initial | 1037.97 | 269 | 0.872 | 0.857 | 0.095<br>(0.089, 1.01) | 0.071 |
| Modified | 783.72 | 266 | 0.914 | 0.903 | 0.077<br>(0.072, 0.085) | 0.065 |

*CFI*: comparative fit index; *TLI*: Tucker Lewis index; *RMSEA*: root mean square error of approximation; *SRMR*: standardized root mean square residual

**Table 4- Reliability by the method of internal consistency and relative and absolute stability**

| Factor | Items | Cronbach's alpha coefficient | McDonald’s omega | ICC | CI (95%) |
|---|---|---|---|---|---|
| Factor 1: Personal Self-Efficacy | 4, 5, 10, 11, 17, 20, 21, 24, 25, 26 | 0.939 | - | 0.934 | (0.921, 0.945) |
| Factor 2: Social Self-Efficacy | 6, 7, 8, 12, 13, 15, 27 | 0.906 | 0.9 | 0.902 | (0.883, 0.918) |
| Factor 3: Adaptive Self-Efficacy | 9, 14, 16, 18, 22, 23 | 0.822 | 0.71 | 0.794 | (0.741, 0.836) |
| Factor 4: Informational Self-Efficacy | 1, 2 | 0.962 | 0.88 | 0.96 | (0.949, 0.969) |
| Total | | 0.94 | 0.94 | 0.945 | (0.936, 0.953) |

*ICC*: Intraclass Correlation Coefficient; *CI*: confidence interval

## Table 5- Known-group comparison of CES subscale scores by participants' characteristics

| | Variables | N | Personal Self-Efficacy | | Social Self-Efficacy | | Adaptive Self-Efficacy | | Informational Self-Efficacy | | Total CES | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | M±SD | P | M±SD | P | M±SD | P | M±SD | P | M±SD | P | Effect size |
| **Stroke survivors** | ***Gender*** | | | | | | | | | | | | |
| | Female | 144 | 38.7±8.4 | 0.041$^{a}$ | 27.3±6.2 | 0.118$^{a}$ | 22.9±5.1 | 0.033$^{a}$ | 8.4±2.1 | 0.072$^{a}$ | 97.3±18.5 | 0.038$^{a}$ | 0.21$^{c}$ |
| | Male | 171 | 36.9±8.9 | | 26.5±6.5 | | 21.8±5.4 | | 8.1±2.3 | | 93.3±19.2 | | |
| | ***Marital status*** | | | | | | | | | | | | |
| | Married | 156 | 38.9±8.2 | 0.012$^{b}$ | 27.8±6.0 | 0.021$^{b}$ | 23.1±4.9 | 0.044$^{b}$ | 8.6±2.0 | 0.031$^{b}$ | 98.4±17.8 | 0.015$^{b}$ | 0.035$^{d}$ |
| | Single | 18 | 34.1±9.5 | | 24.9±6.9 | | 20.4±5.8 | | 7.9±2.4 | | 87.3±20.7 | | |
| | Widow | 124 | 36.2±8.7 | | 26.1±6.3 | | 21.5±5.3 | | 8.0±2.2 | | 91.8±19.4 | | |
| | Divorced | 17 | 35.8±9.1 | | 25.4±6.7 | | 21.1±5.6 | | 7.8±2.5 | | 90.1±20.1 | | |
| | ***Types of stroke*** | | | | | | | | | | | | |
| | Ischemic | 263 | 37.9±8.5 | 0.048$^{a}$ | 27.1±6.3 | 0.091$^{a}$ | 22.6±5.2 | 0.039$^{a}$ | 8.3±2.2 | 0.082$^{a}$ | 96.0±18.6 | 0.044$^{a}$ | 0.33$^{c}$ |
| | Hemorrhagic | 52 | 35.2±9.2 | | 25.7±6.6 | | 21.0±5.7 | | 7.9±2.4 | | 89.8±19.8 | | |
| **FCGs** | ***Gender*** | | | | | | | | | | | | |
| | Female | 237 | 39.8±7.6 | 0.028$^{a}$ | 29.4±5.8 | 0.034$^{a}$ | 24.1±4.6 | 0.041a | 8.9±1.8 | 0.063$^{a}$ | 102.2±15.9 | 0.029$^{a}$ | 0.38$^{c}$ |
| | Male | 78 | 37.1±8.4 | | 27.6±6.2 | | 22.7±5.1 | | 8.5±2.0 | | 95.9±17.4 | | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Education level*** | | | | | | | | | | | | |
| Illiterate | 5 | 30.3±7.5 | 0.001[b] | 23.9±5.8 | 0.002[b] | 20.8±5.1 | 0.006[b] | 5.9±3.1 | 0.004[b] | 80.9±14.7 | 0.001[b] | 0.094[d] |
| Primary school | 12 | 34.2±8.9 | | 25.8±6.7 | | 21.0±5.3 | | 7.4±2.3 | | 88.4±18.7 | | |
| Middle school | 42 | 37.5±8.1 | | 27.9±6.1 | | 22.8±4.9 | | 8.2±2.0 | | 96.4±16.9 | | |
| High school/diploma | 143 | 39.7±7.4 | | 29.1±5.9 | | 24.0±4.7 | | 8.8±1.9 | | 101.6±15.8 | | |
| Academic | 113 | 41.3±7.2 | | 30.2±5.6 | | 25.1±4.4 | | 9.2±1.7 | | 105.8±14.6 | | |
| ***Marital status*** | | | | | | | | | | | | |
| Married | 222 | 40.1±7.5 | 0.017[b] | 29.5±5.8 | 0.021[b] | 24.3±4.6 | 0.033[b] | 8.9+1.8 | 0.042[b] | 102.8±15.4 | 0.019[b] | 0.031[d] |
| Single | 79 | 37.2±8.2 | | 27.4±6.2 | | 22.6±5.0 | | 8.3+2.1 | | 95.5+17.8 | | |
| Widow | 5 | 36.1±9.3 | | 26.8±6.5 | | 22.1±5.4 | | 8.1+2.2 | | 93.1+19.2 | | |
| Divorced | 9 | 35.8±8.7 | | 26.3±6.4 | | 21.7±5.3 | | 7.9+2.4 | | 91.7+18.9 | | |
| ***Income adequacy*** | | | | | | | | | | | | |
| Enough | 70 | 42.1±6.9 | <0.001b | 31.0±5.2 | <0.001b | 25.4±4.2 | 0.001b | 9.4±1.6 | 0.002[b] | 108.0±13.7 | 0.010[b] | 0.125[d] |
| Insufficient | 184 | 36.9±8.3 | | 27.2±6.3 | | 22.5±5.0 | | 8.1±2.1 | | 94.7±17.9 | | |
| Somewhat sufficient | 61 | 39.4±7.6 | | 29.0±5.7 | | 23.9±4.6 | | 8.7±1.8 | | 101.0±15.5 | | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Relationship to stroke survivors*** | | | | | | | | | | | | |
| Spouse | 54 | 41.2+7.1 | 0.008[b] | 25.0±4.3 | 0.011[b] | 25.0+4.3 | 0.019[b] | 9.1+1.7 | 0.028[b] | 105.7±14.8 | 0.026[b] | 0.044[d] |
| Child | 195 | 38.7±7.8 | | 28.6±6.0 | | 23.4+4.8 | | 8.6±1.9 | | 99.3±16.5 | | |
| Sister/ Brother | 30 | 37.4±8.4 | | 27.8±6.3 | | 22.9+5.1 | | 8.4+2.0 | | 96.5±17.8 | | |
| Father or mother | 5 | 36.9±9.1 | | 27.0±6.5 | | 22.5±5.4 | | 8.3±2.2 | | 94.7±19.0 | | |
| Friends and other family members | 31 | 35.8±8.7 | | 26.5±6.4 | | 21.8+5.3 | | 8.0±2.3 | | 92.1±18.4 | | |
| ***Caregiver's position in their own family*** | | | | | | | | | | | | |
| Mother | 176 | 40.4±7.3 | 0.022[b] | 29.6±5.8 | 0.031[b] | 24.4±4.6 | 0.038[b] | 8.9±1.8 | 0.044[b] | 103.3±15.2 | 0.026[b] | 0.039[d] |
| Father | 41 | 38.9+7.9 | | 28.5±6.1 | | 23.6±4.9 | | 8.6±2.0 | | 99.6±16.8 | | |
| It doesn't apply | 84 | 37.5±8.2 | | 27.4±6.3 | | 22,8±5.0 | | 8.3±2.1 | | 96.0±17.9 | | |
| Other | 14 | 36.8+8.6 | | 26.9±6.4 | | 22.4±5.2 | | 8.2+2.2 | | 94.3±18.5 | | |

*FCGs*: family caregivers
*a* t-test; *b* One-way ANOVA; *c* Cohen’s d; *d* Eta squared
P<0.05

**Table 6: Summary of factor restructuring in the CES that led to the development of the Persian Version of the CES – Stroke Survivors' Version**

| CES | | Changes Applied | Persian Version of the CES – Stroke Survivors' Version | |
|---|---|---|---|---|
| Factors | No of items (Items) | | Factors | No of items (Items) |
| -Personal Self Efficacy | 16 (1, 2, 5, 9,10, 11, 15, 16, 17, 19, 20, 21, 23, 24, 25, 26) | Items 1 and 19 removed; Items 25 ;transferred to Social Self-Efficacy Items 9, 16, and 23 transferred to Adaptive Self-Efficacy | -Personal Self Efficacy | 10 (4, 5, 10, 11, 17, 20, 21, 24, 25, 26) |
| -Social Self Efficacy | 5 (6, 8, 12, 13, 27) | Items 7 transferred from Caregiver Self-Efficacy; Item 15 transferred from Personal Self-Efficacy | -Social Self Efficacy | 7 (9, 14, 16, 18, 22, 23) |
| Caregiver Self-Efficacy | 7 (2, 3, 7, 14, 18, 22, 30) | Item 30 removed; Items 2 and 3 -transferred to Informational Self Efficacy; Item 7 transferred to Social Self-Efficacy; Items 9, 16, 23 added from Personal Self-Efficacy | -Adaptive Self Efficacy | 6 (9, 14, 16, 18, 22, 23) |
| Advocacy Self-Efficacy | 2 (2, 29) | The factor name was changed; Items and 26 removed; Items 2 and 3 8 added from Caregiver Self-Efficacy | Informational Self-Efficacy | 2 (2, 3) |