



OPEN Development and psychometric test of self-advocacy scale for patients with stroke

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Self-advocacy is essential for self-management in stroke patients. However, a validated scale to assess the level of self-advocacy in this population is lacking. This study aimed to develop a self-advocacy scale for stroke patients and validate its psychometric properties. This cross-sectional study involved instrument development and psychometric testing, conducted in three stages. In stage 1, dimensions and items were generated through concept analysis, semi-structured interviews, and refined through a Delphi survey. Stage 2 focused on content and face validity assessment. Stage 3 evaluated psychometric properties. A total of 565 stroke patients participated in the items selection from August 2024 to November 2024. The self-advocacy scale was assessed through content validity, construct validity, internal consistency, and test-retest reliability. The study adhered to the STROBE checklist for reporting. From an initial 40-item pool, 24 items were retained after expert consultation and item analysis. The scale demonstrated a content validity index of 0.967. Exploratory factor analysis revealed a five-factor structure, explaining 68.285% of the total variance. Confirmatory factor analysis supported this structure with acceptable fit indices. The scale's overall Cronbach's α coefficient was 0.936, with the dimensions' Cronbach's α values ranging from 0.816 to 0.898. Split-half reliability was 0.874, and test-retest reliability was 0.885 (2-week interval). The 24-item self-advocacy scale for stroke patients demonstrated robust psychometric properties, providing a valid tool for clinical and research applications.

Keywords Stroke, Self-advocacy scale, Psychometric properties, Delphi survey

According to Global Burden of Disease (GBD) studies, stroke ranks as the second leading cause of disability-adjusted life years (DALYs) and mortality worldwide¹. In China, it is the foremost cause of death and disability among adults². At present, the health management status of stroke patients in China is not optimistic. In addition to poor control of risk factors such as hypertension, diabetes and dyslipidemia, stroke patients also have the status quo of smoking, drinking, poor eating habits, insufficient exercise and poor medication compliance^{3,4}. Addressing these challenges requires innovative strategies, with health management playing a pivotal role in secondary prevention. Self-advocacy may offer a novel approach to enhancing the health management of stroke patients.

Self-advocacy refers to the willingness and ability of patients to represent their own interests when managing diseases or disabilities, including obtaining relevant information and communicating their own needs and care preferences effectively with health care providers^{5,6}. Self-advocacy emphasizes the active participation of patients, focusing on their experiences and needs, and interacts with medical staff and the environment, which fully reflects the patient-centered nursing model^{7,8}. Empirical studies^{9–11} demonstrates that self-advocacy can directly or indirectly improve patient health outcomes, such as improving patient compliance, quality of life and satisfaction with care. Individuals obtain the information and support they need to manage related diseases through self-advocacy¹⁰, thereby obtaining higher-quality, patient-centered care¹².

At present, foreign studies related to self-advocacy mainly originate from cancer¹³, AIDS^{5,12}, mental illness^{9,14}, patients with acquired brain injury¹⁵, and the elderly¹⁶. Some self-advocacy related assessment tools have been constructed and verified in this process. but the relevant assessment tools have variability depending on the research subjects and measurement indicators. In China, Self-advocacy related research is still in the exploratory

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stage^{17,18}, with the research object mostly focusing on tumor patients, and the research content involves the Chineseization of the scale, validation, and the exploration of influencing factors. In general, there is still a lack of domestic and international research on self-advocacy in stroke patients, and there is no specific assessment tool. Moreover, there are significant differences in the applicable population, construction methods and contents of self-advocacy assessment tools, which cannot better reflect the population characteristics of stroke patients. In view of this, it is necessary to carry out basic research work such as the development of assessment tools, in order to provide reference for further research on self-advocacy of chronic disease groups such as stroke. In conclusion, this study aims to conceptualize self-advocacy in stroke patients through systematic concept analysis and qualitative exploration, integrating theoretical frameworks with clinical insights, and develop a psychometrically robust assessment instrument to enable healthcare providers to quantitatively evaluate patients' self-advocacy levels, thereby informing the design of targeted intervention strategies.

Methods

Aim

The aim of this study was to develop a new instrument for assessing the self-advocacy for patients who had a stroke and to examine its psychometric properties.

Design

A cross-sectional, three-stage study was conducted using both quantitative and qualitative approaches to develop and validate self-advocacy scale for patients with stroke. It involved three stages: (1) item generation and revision; (2) content and face validation; (3) psychometric properties evaluation. The development process of the scale is shown in Fig. 1. The study report followed the STROBE statement: standards for reporting observational studies (supplementary file 1)¹⁹.

Stage 1: items generation and revision

Concept analysis

In the first stage, literature review was conducted. Using the Rodgers evolutionary concept analysis method²⁰, with “self-advocacy” and “advocacy” as the main topics, we searched PubMed, Web of Science, EBSCO, Embase, PsycINFO, CNKI, Wanfang database, VIP database and CBMdisc database. The search period was from the establishment of the database to August 30, 2023. The search results showed that there were few literatures related to self-advocacy in stroke patients, and the search scope was expanded to include chronic disease patients. Through systematic literature review and analysis, this paper analyzes and integrates the relevant contents of the concept of self-advocacy, and summarizes the conceptual attributes of the self-advocacy of patients with chronic diseases into four core characteristics: self-cognition, self-decision making, effective communication and connection power. The definition of the concept attributes provides a theoretical reference for the division of the initial scale dimensions, the results of this part have been published²¹.

Qualitative interview

A descriptive qualitative design was implemented, involving semi-structured interviews with 19 stroke patients, 6 caregivers and 8 medical staff from Zhengzhou Central Hospital and Luoyang Central Hospital in Henan Province, China from October 2023 to February 2024, to explore the cognitive experience of stroke patients' self-advocacy. This phase aimed to operationalize the conceptual framework of self-advocacy in stroke patients and inform scale development. The interview outline were shown in supplementary file 2. The data were analyzed by the method of content analysis and partial reference to grounded theory^{22,23}. The results showed that the concept of self-advocacy in stroke patients included 5 themes and 14 sub-themes. They are as follows: awareness of rights and interests (clear scope of rights, use of health services, maintain firm beliefs), self-cognition (accept the facts of the disease, have knowledge of the disease, know their needs), effective communication (express their needs, take the initiative to get satisfied), seeking support (self-support, family support, social support, social participation), and self-decision making (weighing pros and cons/risks, conscious not to follow blindly). According to the theme and content extracted by qualitative research, the scale item dimension and item pool were adjusted and supplemented to form the initial scale item pool (including 5 dimensions and 40 items).

Delphi consultation

The next, we invited experts from multiple fields: chronic disease management, rehabilitation, neurology, health service and nursing for Delphi consultation from May 2024 to June 2024. Consultation experts were chosen based on three criteria: (1) having at least ten years of work experience, (2) holding an intermediate or advanced level certificate, and (3) willing to participate in the study. A total of 18 experts from eight provinces of China participated in the survey. After two rounds of consultation, the content of the dimensions and items were agreed upon by the experts. Kendall's concordance coefficient was used to determine the level of agreement among the experts²⁴. In the two Delphi consultation rounds, Kendall's W test was statistically significant ($p < 0.01$), indicating that the experts were in agreement. A total of 13 items were modified, 7 were deleted, 11 were combined, 3 items were added, and 9 were altered. This resulted in a final draft of 30 items.

Stage 2: content and face validation

Following item generation, 18 experts were invited to assess the scale's content validity. The experts were from multiple fields, and the inclusion criteria are the same as in stage 1. To gather expert opinions, a four-point Likert scale was used, with one point (irrelevant) and four points (highly relevant). The item's content validity index (I-CVI) was calculated by dividing the number of experts who gave it 3 or 4 points by the total number of experts. Each item's I-CVI score was averaged to calculate the scale's content validity index (S-CVI). An

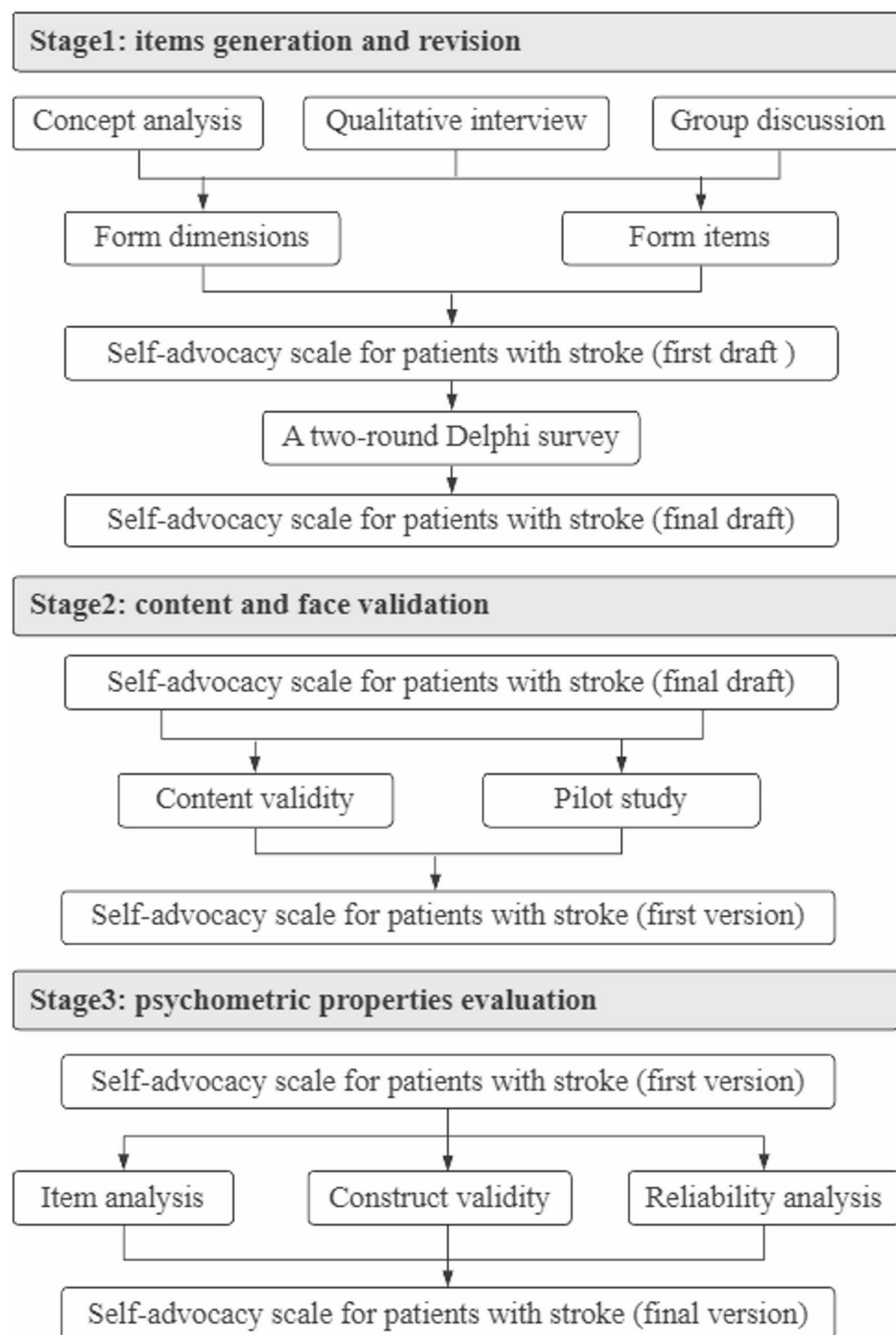


Fig. 1. The development process of the self-advocacy scale for patients with stroke.

S-CVI score of 0.90 or higher and an I-CVI score of 0.78 or higher were required to meet the content validity standards²⁵.

Following the experts' evaluation of the content validity, we conducted an preliminary exploration of the 30-item scale. Since the 5-point scale form was most frequently chosen as the easiest to complete and item omission was least prevalent, we employed the 5-level Likert scoring method (Strongly disagree = 1, disagree = 2, General = 3, agree = 4, Strongly agree = 5)^{26,27}. The preliminary scale was piloted on 20 stroke survivors prior to the formal investigation to make sure it was understandable and appropriate for formal research. After

completing the instrument, stroke survivors were asked to assess a problem's significance, ease of use, accuracy, ambiguity, and whether there is a better way to describe it²⁸. They were also invited to offer ideas on how the instrument could be made better.

Stage 3: psychometric properties evaluation

Participants and setting

We recruited stroke patients from two hospitals (Zhengzhou City Central Hospital and Luoyang City Central Hospital) in Henan province, China, using convenience sampling between August 2024 and November 2024 after obtaining approval from the hospital's administrative office. The study's inclusion criteria were as follows: participants had to be 18 years of age or older, survivors of different types of stroke²⁹; have communication skills (Token test ≥ 17 points)³⁰; self-care capability (activities of daily living ≥ 40)³¹; individuals without cognitive dysfunction (mini mental state examination ≥ 17 points)³², and give their informed consent to participate in the study.

The sample size was established using the general rule of the factor analysis^{33,34}, which suggested a sample size-to-item ratio between 5 and 10, and a 10% sample loss rate, and an absolute sample size of at least 200³⁵. Ultimately, a total of 565 stroke survivors were finally included in the study. This sample were randomly assigned to two groups. Sample A comprised 265 stroke survivors for exploratory factor analysis (EFA), item analysis and reality analysis. Sample B comprised 300 stroke survivors for confirmatory factor analysis (CFA). A total of 30 out of the 265 stroke survivors indicated their interested and participated.

Item analysis

Every item on the self-advocacy scale for stroke patients was tested and examined using item analysis in order to screen and assess the items' quality. For item analysis, a variety of analytical techniques were employed, such as critical ratio (CR) analysis, correlation coefficient analysis, and Cronbach's α . To evaluate the discrimination of the items, the samples were separated into two groups: one with high scores (top 27%) and the other with low scores (bottom 27%). For every item, a critical ratio of 3.0 or more was considered acceptable and significant ($P < 0.05$)³⁶. To evaluate the items' applicability, item-total correlation coefficients were computed, with a minimum correlation coefficient of 0.4 being required. Cronbach's α coefficient was used to evaluate the items' homogeneity after each item was removed. Ideally, deleting any item should not increase the total Cronbach's α coefficient. Items were removed from the initial scale if they failed to meet these requirements^{37,38}.

Construct validity

To determine the scale's factor structure, exploratory factor analysis (EFA) was used. The appropriateness of factor analysis was verified using the Bartlett's test of sphericity ($p < 0.05$) and the Kaiser-Meyer-Olkin coefficient ($KMO > 0.6$). The number of retrieved elements was determined using a scree plot and eigenvalues > 1 . We eliminated items that had a factor loading of less than 0.4, a factor loading across two or more factors, and a difference of less than 0.2³⁹. More than 40% of the total variance should be explained by all common components^{40–42}.

To confirm the fit of the factor structure obtained from the EFA in sample B, confirmatory factor analysis (CFA) was carried out. For CFA, a sample size of 200 would be adequate⁴³. By computing the following indices, the overall fit of the model was ascertained: the RMSEA (root mean square error of approximation), the TLI (tucker-lewis index), the IFI (incremental fit index), the GFI (goodness-of-fit index), the ratio between chi-square and the degrees of freedom (χ^2/df), and the chi-square goodness-of-fit test. A model that was deemed acceptable was indicated by the GFI values being > 0.80 and the RMSEA being less than 0.08. A value > 0.90 for the CFI, TLI, and IFI indicates that the model path map and the real data fit each other well^{44,45}.

The average variance extracted (AVE) and composite reliability (CR) values were computed in order to evaluate the convergent validity. When the AVE value is more than 0.50 and the CR value is more than 0.70, the scale has acceptable convergent validity⁴⁶. Correlation coefficients between variables and the square root of the AVE value were used to assess discriminant validity. The square root of the AVE value must be greater than the correlation coefficients between the respective components⁴⁶.

Internal consistency reliability and test-retest reliability

The internal consistency reliability of the scale was evaluated by computing the split-half reliability coefficient and the Cronbach's α coefficient. In order to evaluate the scale's consistency across time, 30 participants who had already completed the survey were asked to do so again two weeks later. The split-half reliability coefficient, the Cronbach's α coefficient, and the test-retest reliability coefficient must all be 0.70 or more to demonstrate strong internal consistency, reliability, and test-retest reliability^{47,48}.

Data collection

Informed permission and expert consultation questionnaire outlining the study's purpose and significance were distributed to the experts via WeChat or email. Experts were requested to provided feedback and suggestions within two weeks of receiving the questionnaire. A total of 580 stroke survivors participated in the survey between August 2024 and November 2024 from two hospitals in Henan, China. Prior to formal investigation, the researchers were fully trained in conducting the questionnaire survey. Among the 580 invited stroke patients, 565 valid questionnaires were obtained.

Data analysis

Data were analyzed using SPSS 26.0 and AMOS 26.0 software. The scale's items were revised, and its content validity was assessed through the Delphi survey. To investigate the underlying factor structure, the maximum

variance rotation was used in the EFA. The structural equation model for the CFA was established using the maximum likelihood method in order to confirm that the factor structure and the predicted dimension were consistent. In order to verify the reliability of the scales, internal consistency analysis and test-retest reliability analysis were used to evaluate the stability and homogeneity of the scales, respectively.

Ethical consideration

This study was approved by the Research Ethics Committee of Zhengzhou University (ZZUIRB2023-277). For formal investigation, the participants were explained the purpose and procedure of the research and invited to sign an informed consent form. Participants had complete autonomy to discontinue participation in the study at any time.

Results

Content and face validity

Content validity was assessed via email or WeChat consultations with 18 experts. In the first round of content validity evaluation, the scale content validity index (S-CVI) was 0.814, whereas the item content validity index (I-CVI) varied between 0.389 and 1.000. 13 items were altered, 7 were removed, 11 were combined, 3 were added, and 4 were changed. Consequently, a draft of 30 items was produced. During the second evaluation round, the scale content validity index (S-CVI) was 0.967, while the item content validity index (I-CVI) varied between 0.833 and 1.000. Minor refinements were made to 5 items in this phase, including the addition of two guiding words and no items deletions, resulting in total of 30 retained items.

A pilot survey was administered to 20 stroke survivors. The completion time of the scale was approximately 11 min, indicating appropriate item count and complexity. In addition, additional explanations were made based on the unclear presentation of individual items in the stroke survivor feedback scale, such as the addition of “(e.g., daily needs and medical needs)” to item 12 and item 20. As a result, the revised 30-item self-advocacy scale was chosen as the psychometric test version.

Psychometric testing of the scale

Participants characteristics

A total of 580 participants surveyed, 565 (97.4%) completed the questionnaire. The participants' demographic characteristics are shown in Table 1.

Item analysis

The item analysis results of the self-advocacy scale are presented in Table 2. Items with a CR with $p > 0.05$, items with a corrected item-total correlation coefficient value lower than 0.4, and items with Cronbach's α of the scale more than 0.950 were considered for deletion. Results indicated that item 24 failed to meet the correlation coefficient threshold. However, considering that family and friends are an important source of social support for stroke patients and that the correlation coefficient between this item and the total scale and 0.4 is relatively close, this item was retained after team discussion. Ultimately, no items were deleted based on item analysis criteria.

Construct validity

The KMO value was 0.923 and Bartlett's test of sphericity ($\chi^2 = 5161.682$, $p < 0.001$) reached significance, confirming data suitability for EFA. Scree plot analysis supported a five-factor solution. Items 13, 20, and 25 were deleted because their factor loadings were less than 0.4. Items 2, 6, and 28 were deleted because they had cross loadings. Then we performed the second EFA for the remaining 24 items. The KMO value was 0.908 and Bartlett's test of sphericity ($\chi^2 = 4009.113$, $p < 0.001$). The five-factor structure (Fig. 2) explained 68.285% of the total variance, with individual factor contributions as follows: 17.076%, 14.464%, 12.784%, 12.250%, and 11.711%. Detailed results are shown in Table 3.

The initial structural model was modified in CFA based on the modification index, and the adjusted fitting indices were analyzed (Fig. 3). The following fit indices demonstrated an acceptable fit for the five-factor structure: $\chi^2/df = 2.586$, RMSEA = 0.073, GFI = 0.845, CFI = 0.924, TLI = 0.912, IFI = 0.925. The selected fitting indices provided further evidence consistent with the EFA results, indicating that the five-factor structure scale exhibited an appropriate fit. In the convergent validity analysis, the AVE values ranged from 0.570 to 0.674, and CR values ranged from 0.864 to 0.912. In the discriminant validity analysis, the square root values of AVE fluctuated between 0.755 and 0.821, each exceeding the correlation coefficients of their respective factors (Table 4).

Internal consistency reliability and test-reliability

For the self-advocacy scale, the split-half reliability and Cronbach's α were 0.874 and 0.936, respectively. The split-half reliability and Cronbach's α of each scale dimension ranged from 0.756 to 0.871 and from 0.816 to 0.898, respectively. The retest reliability of each dimension ranged from 0.755 to 0.853, while the average test-retest reliability of the overall scale was 0.885. Table 5 presents the results of this investigation.

Final instrument

The self-advocacy scale for stroke patients comprises 30 items across 5 dimensions: (1) Awareness of rights and interests (4 items); (2) Self-cognition (6 items); (3) Effective communication (5 items); (4) Seeking support (5 items); and (5) Self-decision making (4 items). All items are rated on a 5-point Likert scale (1 = Strongly disagree, 5 = Strongly agree) to assess the current self-advocacy status of stroke survivors. The scale score ranges from 24 to 120, with higher scores indicating better self-advocacy.

Characteristics	Participants involved in the EFA (n1)	Participants involved in the CFA (n2)
Variable	Mean $\pm$ standard deviation/N (%)	Mean $\pm$ standard deviation/N (%)
Age	61.17 $\pm$ 9.367	62.28 $\pm$ 9.839
Gender		
Male	157(59.2)	193(64.3)
Female	108(40.8)	107(35.7)
Education level		
Primary school or below	44(16.6)	87(29.0)
Junior high school	97(36.6)	104(34.7)
High school	81(30.6)	73(24.3)
College or above	43(16.2)	36(12.0)
Marital status		
Single	1(0.4)	6(2.0)
Married	241(90.9)	265(88.3)
Divorced/Widow(er)	23(8.7)	29(9.7)
Employment status		
On-the-job	38(14.3)	58(19.3)
Forced to quit	28(10.6)	18(6.0)
Retirement	135(50.9)	154(51.3)
No job	64(24.2)	70(23.3)
Household monthly income (RMB)		
< 1000	17(6.4)	53(17.7)
1000~	73(27.5)	82(27.3)
2000~	116(43.8)	81(27.0)
3000~	59(22.3)	84(28.0)
Time since stroke		
< 3 months	131(49.4)	182(60.7)
3 months ~	18(6.8)	19(6.3)
1 year ~	42(15.8)	47(15.7)
3 years ~	74(27.9)	52(17.3)
Type of stroke		
Ischemic stroke	227(85.7)	262(87.3)
Hemorrhagic stroke	28(10.6)	24(8.0)
Mixed	10(3.8)	14(4.7)
Number of strokes experienced		
One	137(51.7)	177(59.0)
Two	78(29.4)	94(31.3)
Three or more	50(18.9)	29(9.7)

Table 1. Demographic characteristics of the participants ($n = 565$, $n1 = 265$, $n2 = 300$). EFA: exploratory factor analysis; CFA: confirmatory factor analysis.

Discussion

Accurate and objective assessment of the self-advocacy level in stroke patients may provide a new breakthrough for research related to stroke patients' health management. It also helps nursing staff to formulate targeted and individualized health education and nursing intervention plans. In recent years, international scholars^{10,11,49} have increasingly focused on self-advocacy, achieving significant research outcomes. However, domestic studies in this field remain in their infancy, primarily focusing on female cancer patients^{17,18}, with a lack of scientific and effective assessment tools for other study populations. This study developed and verified the reliability and validity of a 30-item self-advocacy scale for stroke patients. The research results showed that it had sufficient content validity, internal consistency, structural validity and re-test reliability. In the scale development process of this study, the principles and procedures of scale development were strictly followed.

This study developed the initial draft of the scale through concept analysis, semi-structured interviews, and other methods, following a scientific and standardized process. The initial draft was revised via the Delphi method and pre-survey to form the initial scale. The concept analysis of self-advocacy among patients with chronic diseases identified four concept attributes, namely self-cognition, self-decision making, effective communication, and connection with power, providing theoretical references for the dimension division of the initial scale. Through semi-structured interviews with stroke patients, caregivers, and medical staff, five

Item	t value (CR)	P	Corrected item-total correlation coefficients	Cronbach's a if item deleted	Retained item
1	-9.524	<0.001	0.613	0.948	√
2	-14.813	<0.001	0.733	0.947	√
3	-9.475	<0.001	0.626	0.948	√
4	-11.043	<0.001	0.614	0.948	√
5	-10.437	<0.001	0.560	0.949	√
6	-10.916	<0.001	0.704	0.947	√
7	-11.202	<0.001	0.659	0.948	√
8	-13.021	<0.001	0.704	0.947	√
9	-10.080	<0.001	0.658	0.948	√
10	-10.365	<0.001	0.623	0.948	√
11	-14.276	<0.001	0.705	0.947	√
12	-16.341	<0.001	0.760	0.947	√
13	-9.185	<0.001	0.491	0.949	√
14	-14.276	<0.001	0.668	0.948	√
15	-9.587	<0.001	0.562	0.949	√
16	-8.183	<0.001	0.563	0.949	√
17	-12.317	<0.001	0.695	0.947	√
18	-18.138	<0.001	0.787	0.946	√
19	-10.926	<0.001	0.554	0.949	√
20	-11.920	<0.001	0.667	0.948	√
21	-18.054	<0.001	0.733	0.947	√
22	-11.330	<0.001	0.648	0.948	√
23	-12.697	<0.001	0.646	0.948	√
24	-6.796	<0.001	0.383	0.950	√
25	-12.457	<0.001	0.640	0.948	√
26	-13.358	<0.001	0.647	0.948	√
27	-15.430	<0.001	0.688	0.947	√
28	-13.539	<0.001	0.716	0.947	√
29	-13.357	<0.001	0.686	0.947	√
30	-6.930	<0.001	0.416	0.950	√
Consider deleting items		>0.05	<0.4	>0.950	

Table 2. Item analysis of the scale (n = 265). CR: critical ration.

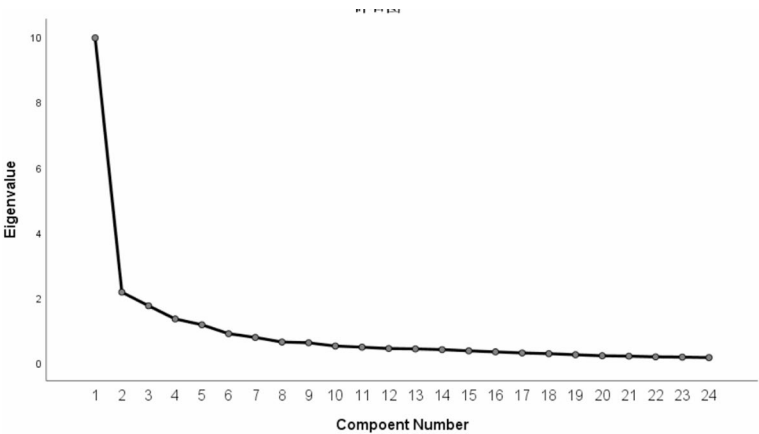


Fig. 2. Screen plot of exploratory factor analysis for the self-advocacy scale (n = 265).

concept connotations of self-advocacy among stroke patients were deeply explored, namely awareness of rights and interests, self-cognition, effective communication, seeking support, and self-decision making, offering rich information for determination the initial scale dimensions and establishing the item pool. The selection of experts for the Delphi method fully considered the authority and representativeness of the experts, covering

Item	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
1	0.270	0.141	0.137	0.146	0.722
3	0.270	0.190	0.141	0.142	0.702
4	0.263	0.224	0.137	0.125	0.680
5	0.096	0.200	0.019	0.293	0.770
7	0.830	0.134	0.179	0.111	0.094
8	0.781	0.203	0.175	0.222	0.088
9	0.731	0.183	0.113	0.101	0.246
10	0.716	0.155	0.071	0.082	0.287
11	0.629	0.066	0.352	0.185	0.283
12	0.680	0.212	0.311	0.185	0.230
14	0.180	0.740	0.221	0.138	0.219
15	0.075	0.702	0.228	0.132	0.113
16	0.171	0.792	0.023	0.124	0.137
17	0.209	0.758	0.140	0.243	0.210
18	0.272	0.647	0.241	0.361	0.245
19	0.120	0.044	0.768	0.216	0.134
21	0.360	0.335	0.629	0.194	0.117
22	0.286	0.282	0.708	0.000	0.179
23	0.322	0.371	0.581	0.070	0.102
24	0.081	0.075	0.797	-0.046	0.008
26	0.167	0.154	0.232	0.780	0.182
27	0.216	0.235	0.112	0.730	0.297
29	0.267	0.255	0.055	0.730	0.258
30	0.055	0.131	-0.036	0.802	0.052

Table 3. Pattern matrix of the scale after the factor analysis ($n = 265$). Factor loading > 0.40 were highlighted in bold.

related fields such as medicine, nursing, management, and psychology. The 18 experts were from eight different provinces in China, with an average working experience of over 10 years, and possessed good scientific research literacy and ability. The positive response rates of the two rounds of expert inquiries were both $> 70\%$, and the Kendall's coefficient of concordance of the two rounds of experts were 0.167 and 0.130 respectively, both $P < 0.001$, indicating that the expert opinions were relatively coordinated and concentrated. The expert opinions and suggestions ensured the quality of the items.

The validity includes content validity, structural validity, and calibration validity. Content validity is established when each item's content validity index (I-CVI) exceeds 0.78 and the overall scale's content validity index (S-CVI) surpasses 0.90⁵⁰. In this study, the scale's S-CVI was 0.967, with individual item I-CVIs ranging from 0.833 to 1.000, indicating strong content validity and confirming that the scale accurately reflects the intended constructs. Currently, self-advocacy evaluation tools have been primarily developed for female cancer patients⁵¹, AIDS patients⁵², and brain injury patients¹⁵, etc. Due to significant differences in evaluation criteria and content, this study did not assess criterion validity. Exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) were used to evaluate structural validity. After two rounds of EFA, the cumulative variance explained by the five common factors was 68.285%, with all items having factor loadings exceeding 0.4, which is considered to demonstrate good structural validity⁵³. The final dimensions and item attributions were consistent with theoretical hypotheses. The CFA model fit was satisfactory, further supporting the scale's validity⁵⁴. Additionally, acceptable average variance extracted (AVE) and composite reliability (CR) values, along with AVE square roots greater than inter-construct correlations, indicate strong convergent and discriminant validity⁴⁶.

Reliability includes internal consistency and stability⁵⁰. Cronbach's α coefficient and split-half reliability are used to measure internal consistency, with a Cronbach's α between 0.8 and 0.9 indicating high internal consistency. Split-half reliability should generally exceed 0.7. Retest reliability measures stability, with values closer to 1 indicating higher stability. A retest reliability above 0.7 signifies adequate stability⁵⁵. In this study, the total scale's Cronbach's α was 0.936, and the Cronbach's α for the five dimensions ranged from 0.816 to 0.898, demonstrating strong internal consistency. The total scale's split-half reliability was 0.874, and the split-half reliability for each dimension ranged from 0.756 to 0.874, all exceeding 0.7. Two weeks later, the retest reliability for 30 stroke patients was 0.885, with retest reliabilities for all dimensions ranging from 0.755 to 0.853. These results confirm the scale's excellent internal consistency and stability⁵⁵.

Finally, the scale consists of 5 dimensions and 24 items, with a moderate number of items and an estimated completion time of 11 min. The content is clear, easy to understand, and user-friendly, ensuring strong operational feasibility and high practicality. The self-advocacy scale for stroke patients developed in this study can provide a more practical assessment tool and theoretical basis for promoting the study of self-advocacy in stroke patients in China.

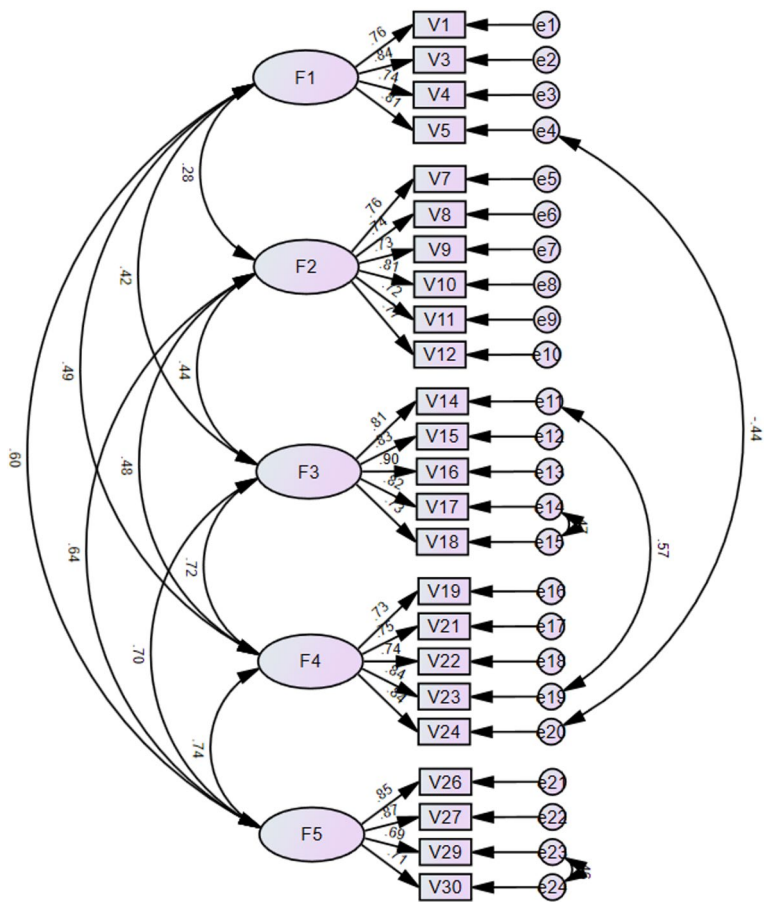


Fig. 3. The five-factor model of the self-advocacy scale ($n = 300$). F1 (Factor 1): awareness of rights and interests; F2 (Factor 2): self-cognition; F3 (Factor 3): effective communication; F4 (Factor 4): seeking support; F5 (Factor 5): self-decision making. V1-V30 indicates specific items in different dimensions.

Factors	Correlation between factors					AVE	Sqrt (AVE)	CR
	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5			
Factor 1	1					0.622	0.789	0.868
Factor 2	0.283	1				0.570	0.755	0.888
Factor 3	0.422	0.442	1			0.674	0.821	0.912
Factor 4	0.488	0.484	0.716	1		0.612	0.782	0.887
Factor 5	0.605	0.635	0.703	0.741	1	0.616	0.785	0.864

Table 4. Convergent validity and discriminant validity of the scale ($n = 300$). AVE: average variance extracted; CR: composite reliability.

Scale	Number of items	Cronbach's α	Split-half reliability	Text- retest reliability
Self-advocacy scale	24	0.936	0.874	0.885
Factor 1	4	0.816	0.756	0.806
Factor 2	6	0.898	0.871	0.755
Factor 3	5	0.876	0.853	0.783
Factor 4	5	0.844	0.852	0.798
Factor 5	4	0.859	0.829	0.853

Table 5. Reliability of the self-advocacy scale ($n = 265$).

Limitations

Our research also has some limitations. First, we only recruited participants who had no cognitive or communication issues so that more information could be gathered more quickly and easily in a shorter amount of time. Since the participants had a disability score of greater than 40, the results might not apply to those who have had more severe strokes. Second, no other relevant scales were tested in this study due to the large differences in the study population, assessment indicators, and content. Third, this study only investigated stroke patients in two tertiary hospitals. Future research could conduct multi-center investigations to verify the applicability of the scale.

Conclusion

This study developed a self-advocacy scale for stroke patients following a standardized scale development process. The scale comprises 5 dimensions and 24 items, with all indicators meeting the criteria for scale development, demonstrating good scientific and practical value. This scale can serve as an effective assessment tool for evaluating self-advocacy in stroke patients, aiding in the exploration of the current status of self-advocacy and related influencing factors among this population. It provides a reliable basis for formulating targeted, individualized, and precise self-advocacy intervention measures.

Data availability

The data supporting the findings of this study are available on request from the corresponding author.

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Author contributions

Conceptualization, ZZX, and ZZX*; methodology, ZZX, CJ*, ZCH, and WSS; formal analysis, ZZX, WXX, and LBL; investigation, ZZX, LBL, WXX, and JH; writing—original draft preparation, ZZX; writing—review and editing, ZZX, CJ*, WSS, QYJ, MYX, and ZCH; supervision, CJ*, LBL, QYJ and ZZX*; project administration, ZZX*. All authors reviewed the manuscript.

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Competing interests

The authors declare no competing interests.

Ethics approval and consent to participate

A full compliance with ethical guidelines and regulations was observed in all methods used in this study. The Zhengzhou University Ethics Committee gave its approval to this study, and the subjects gave their informed consent before their data was collected.

Additional information

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