

# Reliability and Validity of the Chinese version of a Short Form of the Family Health Scale

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## Research Article

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# Abstract

## Objective

To translate a Short Form of the Family Health Scale (FHS-SF) and to test the reliability and Validity of the Chinese version of the FHS-SF.

## Method

A Short Form of the Family Health Scale was Chinese translated with the consent of the original author. A total of 8912 residents were surveyed in 120 cities across China using a multistage sampling method, with gender, ethnicity, and education level as quota variables. 750 participants were selected to participate in this study, and 44 participants were randomly selected to be retested one month later.

## Result

The Cronbach's alpha of the Chinese version of a Short Form the Family Health Scale was 0.83, the Cronbach's alphas of the four subscales ranged from 0.70 to 0.90, the retest reliability of the scale was 0.75, the standardized factor loadings of the validation factor analysis were above 0.50, GFI = 0.98; NFI = 0.97; RFI = 0.95; RMSEA = 0.07, all within acceptable limits.

## Conclusion

The Chinese version of a Short Form the Family Health Scale has good reliability and validity and can be used to assess the level of family health of Chinese residents.

## 1 Introduction

With the release of the Health China Action (2019-2030), family health is receiving increasing attention from experts and scholars (Cheng, 2020). Family health is "a resource at the level of the family unit, developed from the health, interactions and capabilities of each family member and the intersection of the family's physical, social, emotional, economic and medical resources" (Weiss-Laxer, Crandall, Okano, & Riley, 2020). A healthy family promotes a sense of belonging among family members (Kim, Kreps, & Shin, 2015) and fosters the ability of family members to care for each other and meet life's responsibilities (Hansen, Rosenkranz, Mularski, & Leo, 2016). In addition, family communication can also improve the health-related quality of life among family members (Lim & Ashing-Giwa, 2013). Families have an important role in maintaining health and preventing disease because family members may support each other at all stages of life in ways that other systems cannot (Robinson et al., 2017). In fact, the economic value of care provided by families over the lifetime of an individual is much greater than that of the health care system (Leiter, Krauss, Anderson, & Wells, 2004). And with the major changes in China's

economic and social system since the 1980s, family health has faced serious challenges(Wan, Yu, & Kolanowski, 2008).

As family health research continues to evolve, the measurement of family health is receiving increasing attention(Fiese et al., 2017). Previous studies have not found self-assessment scales involving multidimensional and interdisciplinary commonality in family health.Simic-Ruzic measured family health by semi-structured interviews in terms of dimensions such as emotional state, communication, boundaries, alliances, adaptability and stability, and family skills (Simic-Ruzic & Jovanovic, 2008), however, the scale used in this study were other assessment scale, which was more cumbersome to operate and not conducive to the popularization of family health research. So more researchers tend to use self-assessment scales to measure family health, such as the Family Assessment Scale(Epstein, Baldwin, & Bishop, 1983), the Family Adaptability and Cohesion Rating Scale(Olson, 2011), and the Family Functioning Scale(Wang & LI, 1998), but these scales only measure one aspect of family health: family functioning. Further research led researchers to realize that family health should not be limited to only one dimension of family functioning, so Weiss-Laxer studied family health in terms of individual family members' health status, behavior, and health care utilization(Weiss-Laxer et al., 2020), while Novilla considered family-level factors such as family structure, composition and income together(Novilla, Barnes, Natalie, Williams, & Rogers, 2006).Which were mainly caused by the non-existence of validated measures of family health.

Crandall constructed a family health measurement network by inviting interdisciplinary family health experts using the Delphi method, and based on this resource network, they constructed a long-form of Family Health Scale containing four dimensions: family/social and emotional health processes, family healthy lifestyles, family health resources, and social support outside the family. The scale has high reliability and validity, however, due to the large number of scale items, fewer items can reduce subjects' fatigue responses and increase the completion rate in practical studies(Tayama, Ogawa, Takeoka, Kobayashi, & Shirabe, 2017). Therefore, a short form of the Family Health Scale was further composed by taking the 2-3 items with the highest loadings from each of the four dimensions (Crandall et al., 2020). This short form is only available to adults who are 18 years of age or older. The result of the study indicates that a Short Form of the Family Health Scale has good reliability and validity.

At present, there is no family health scale in China that involves multidimensional and interdisciplinary commonality. Therefore, this study aims to translate the Family Health Scale-Short Form (FHS-SF) compiled by Crandall, and test its reliability and validity to form a Chinese version of the FHS-SF, so as to provide a quantitative tool for assessing family health problems in China.

## 2 Materials And Methods

### 2.1 Sample

The survey was conducted from May 2021 to September 2021, using a multi-stage sampling method that directly included the provincial capitals of 23 Chinese provinces and 5 autonomous regions, 4

municipalities directly under the central government (Beijing, Tianjin, Shanghai, Chongqing), and 2-6 cities in each of the non-capital prefecture-level administrative regions of each province and autonomous region using the random number table method, for a total of 120 cities. At least one surveyor or one survey team was recruited in each city, with each surveyor liable for collecting 30-90 questionnaires and each team responsible for collecting 100-200 questionnaires. The enumerators were required to obtain a sample with gender, age, and urban/rural distribution that generally matched the demographic characteristics based on the results of the "7th National Census, 2021." The study was ethically reviewed (JNUKY-2021-018). The inclusion criteria were adults aged  $\geq 18$  years who all signed an informed consent form and voluntarily participated in this study. A total of 8912 residents were surveyed, and a total of 750 cases were sampled based on the data from the 7th National Census, and the sampling method studied by Crandall using gender, nation, and education level as quota variables(see Table 1).

Table 1 Sampling frame																				
	Male (384)										Women (366)									
	Han nationality (350)					Minority nationality (34)					Han nationality (333)					Minority nationality (33)				
education attainment	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
number of people	9	94	131	57	59	1	9	13	5	6	10	89	124	54	56	1	9	12	5	6

Education: 1: illiterate; 2: primary; 3: junior high school; 4: high school; 5: university

## 2.2 Measures

### 2.2.1 The General information questionnaire

The researcher prepared the general information questionnaire, which included the gender, age, nation, marital status, permanent residence, household registration, highest educational level, occupational status, number of siblings, and monthly per capita household income.

#### 2.2.2 The Chinese version of FHS-SF

The Family Health Scale was developed by Crandall and Weiss-Laxer, and was designed to develop a tool that would effectively measure family health. The instrument consists of a Long Form of the Family Health Scale (FHS-LF) and a Short Form of the Family Health Scale (FHS-SF), which contains four dimensions: Family/social/emotional health processes, Family healthy lifestyle, Family health resources, and Family external social supports, while the Short-Form Scale consists of 2-3 items with higher factor loadings and weights drawn from each dimension. Crandall's study found that the Cronbach's alpha of the FHS-SF was 0.80. This study will carry out the Chineseization of the FHS-SF.

## 2.3 Translation process

### 2.3.1 Translation and back-translation of the scale

Authorization for translation and use was obtained from the authors of the FHS-SF, and the scale was translated independently by 2 researchers (1 master in medicine and 1 master in translation). Afterward, 1 medical-oriented master and 2 translators participated together to compare and discuss the similarities and differences between the 2 translations to form the first draft of the Chinese version of the scale. Then 2 master's degree students in translation were invited to back-translate the first draft of the Chinese version of the scale separately without knowing the specific contents of the scale. The researcher and the 2 back-translators were involved in formulating the back-translated version of the FHS-SF. All members involved in the translation and back-translation were then asked to discuss the similarities and differences between the original scale, the first draft of the translation, and the back-translated scale to ensure that they were equivalent and to avoid ambiguity.

### 2.3.2 Cultural debugging of the scale

Five experts in the field of family health were invited to form a panel of experts, who were asked to comment on and revise the formulation of the items in the light of the scale's target audience and the cultural background of our country, and to propose amendments. The experts were asked to judge whether the content of each entry was in line with the current situation of families in China, to make adjustments to inappropriate points, and to make certain modifications based on our language expression habits without changing the original meaning, such as replacing "家庭成员之间经常发生争吵" with "家庭成员之间经常发生口角", "家庭成员之间经常发生矛盾" changed to "家庭成员之间经常发生分歧". Finally, all 10 items are retained to form a Chinese version of the Family Health Scale.

Twenty-five people of different age groups were selected for the pre-survey in May 2021. The survey instruments were a paper version of the General Information Questionnaire and a Chinese version of the Family Health Short Form, and the subjects were asked about the clarity and comprehensibility of the entries after completing the survey.

## 2.4 Statistical analysis

SPSS 22.0 and AMOS 22.0 were used to analyze the data, and data with questionnaire response lengths shorter than a quarter digit, inconsistent logic checks, incomplete information, duplicate fills, and data where the options checked were all the same or had a regularity. The counting data were described by frequency and percentage. The correlation coefficient, extreme group method, and CITC method were used for item analysis. The reliability of the scale was evaluated by internal consistency Cronbach's alpha and test-retest reliability; scale validity was analyzed by content validity and structural validity (validation factor analysis). All data were tested using a two-sided test, and  $p < 0.05$  indicated that the differences were statistically significant.

## 3 Results

### 3.1 Demographic characteristics of the sample

Among the 750 surveyed residents, 384 (51.2%) were male and 366 (48.8%) were female; 571 (76.1%) were married; 416 (55.5%) were urban residents and 334 (45.5%) were rural residents; 294 (39.2%) were non-agricultural households and 456 (60.8%) were agricultural households; 248 (33.0%) had high school education or above; 180 cases (24.0%) were aged 60 and above; 140 cases (18.7%) had a monthly per capita household income of RMB 1,500 and below, and 46 cases (6.1%) had a per capita household income of RMB 10,501 and above; The two categories with the highest number of occupations were those with no fixed occupation and those in employment, while the two lowest categories were retirees and students (see Table 2).

**Table 2** General demographic characteristics of the surveys

General demographic characteristics	number of people	Percentage (%)	General demographic characteristics	number of people	Percentage (%)
<i>Gender</i>			<i>Age (years)</i>		
Male	384	51.2	19-25	71	9.5
Female	366	48.8	26-30	62	8.3
<i>Marital status</i>			31-35	40	5.3
unmarried	116	15.5	36-40	52	6.9
married	571	76.1	41-45	129	17.2
divorced	17	2.3	46-50	118	15.7
widowed	46	6.1	51-55	75	10.0
<i>Permanent residence</i>			56-59	23	3.1
urban	416	55.5	≥60	180	24.0
rural	334	45.5	<i>Number of siblings</i>		
<i>Household registration</i>			0	72	9.6
non-agricultural	294	39.2	1	148	19.7
agriculture	456	60.8	2	169	22.5
<i>Educational level</i>			≥3	361	48.1
illiterate	21	2.8	<i>Monthly per capita household income</i>		
primary school	201	26.8	≤1500	140	18.7
junior high school	280	37.3	1501-3000	170	22.7
high school	121	16.1	3001-4500	164	21.9
university	127	16.9	4501-6000	121	16.1
<i>Occupational status</i>			6001-7500	55	7.3
students	68	9.1	7501-9000	33	4.4
employment	263	35.1	9001-10500	21	2.8
retirees	112	14.9	≥10501	46	6.1
no fixed occupation	307	40.9			
<i>Nation</i>					
Han nationality	683	91.1			
Minority nationality	67	8.9			

### 3.2 Item Analysis

Pearson correlation was used to examine the correlation between the scores of each item and the total score. The results showed that there were significant and high correlations between the scores of the five items from the Family/social/emotional health processes dimension and the Family healthy lifestyle dimension of the FHS-LF and the total score, with correlation coefficients were 0.77-0.80 and 0.74-0.76, respectively, while the Family health resources and Family external social supports dimensions showed moderate significant correlations, with correlation coefficients of 0.48-0.57 and 0.57-0.59, respectively. Using the highest 27 % and the lowest 27 % of the total scale scores as the boundaries between the high and low subgroups, independent samples t-tests revealed significant differences ( $p < 0.001$ ) between the scores of the high and low subgroups on each item for both scales. The Corrected item total correlation (CITC) were all above 0.30, and the combination of the deleted Cronbach's alpha showed that the internal consistency coefficients did not change much after the deletion of the items (Nunnally, 1967) (see Table 3). The results of item analysis indicate that the Chinese version of a short form of the Family Health Scale (FHS-SF) has good discriminatory power.

**Table 3** Corrected item total correlation of the surveys

Item	Mean value of scale after deletion	Corrected item total correlation	Cronbach's alpha after deletion
A1	34.41	0.71	0.80
A2	34.45	0.69	0.80
A3	34.34	0.69	0.80
A4	34.42	0.66	0.81
A5	34.39	0.74	0.80
A6	34.70	0.36	0.83
A7	34.66	0.49	0.82
A8	34.58	0.45	0.83
A9	35.31	0.31	0.84
A10	34.92	0.42	0.83

### 3.3 Reliability analysis of the Chinese version of the FHS-SF

The Cronbach alpha of the Chinese version of the FHS-SF was 0.83, the Cronbach alpha of the Family/social/emotional health processes subscale was 0.90, the Cronbach alpha of the Family Healthy Lifestyle subscale was 0.83, the Cronbach alpha of the Family Health Resources subscale was 0.72, and the Cronbach alpha of the Family external social supports subscale was 0.70. To test the stability of the scales, 44 participants were re-sampled for the retest reliability survey, and the results showed that the retest reliability of the Chinese version of the FHS-SF after one month was 0.75.

### 3.4 Validity analysis of the Chinese version of the FHS-SF

#### 3.4.1 Structural validity

The validation factor analysis was used to test the structural validity of the scale, and the scale was validated following the structural model of the original Family Health Short Form, and the results showed that the model fit indices were  $\chi^2/df=4.28$ , GFI=0.98, NFI=0.97, RFI=0.95, and RMSEA=0.07<0.08, which is known from the fit indices that the model structural validity is good, and the results of the validation factor analysis are shown in Fig 1.

#### 3.4.2 Content validity

The expert consultation method was used to measure the content validity of the Chinese version of the FHS-SF. The questionnaire was designed after a scientific and comprehensive review of books and literature, and expert consultations and discussions were held on June 7, June 11, June 15, June 18, July 3, and July 8, 2021, before the questionnaire was formally used. The experts consulted were all senior and regionally representative, and their specialties ranged from social medicine, health statistics, health care management, behavioral epidemiology, psychology, Human medicine, clinical medicine, pharmacology, nursing, sociology, etc. Therefore, the content validity of this scale can be guaranteed.

## 4 Discussion

### 4.1 The Chinese version of the FHS-SF has good reliability and validity

The study of family health is of considerable importance as it promotes a sense of belonging among family members, fosters the ability of family members to care for each other and fulfill life responsibilities, and ultimately contributes to the overall development of society(Aslanturk & Mavili, 2020). However, it has only received enough attention in China in recent years, and the definition of family health is confused, probably because of the lack of family health scales that involve multidimensional, interdisciplinary commonality. The purpose of this study is to translate the Family Health Scale-Short Form (FHS-SF) compiled by Crandall. and test its reliability to form the Chinese version of the FHS-SF to provide a quantitative tool for assessing family health problems in China. When a scale is translated or to be used in another culture, it needs to be validated(Chung et al., 2021)<sup>[12, 13]</sup>.

Item analysis showed that there was a significant difference between the scores of high and low subgroups on each item, indicating that the Chinese version of the FHS-SF has a good ability to discriminate between the high and low levels of the subjects' family health. Meanwhile, there was a significant positive correlation between each item score and the total score, with correlation coefficients ranging from 0.48 to 0.80 ( $p<0.001$ ), all of which reached a significant level, and all items of the Chinese version of the FHS-SF met the measurement requirements (Wu, 2003), all of which were retained.

For the reliability test, the Chinese version of the FHS-SF reliability meets the measurement requirements. The Cronbach's alpha of 0.7-0.8 is generally regarded as fairly good and 0.8-0.9 as very good(Wu, 2010).



The Cronbach's alpha of the Chinese version of the Family Health Scale was 0.83, and the Cronbach's alpha of the subscales ranged from 0.70 to 0.90, indicating that the internal consistency of the scale was good. The retest reliability was 0.75, indicating good retest reliability and high stability of the measured family health scores.

For validity testing, this study examined the validity of the Chinese version of the FHS-SF through structural validity and content validity. The modified model fit indices were:  $\chi^2/df=4.28$ , GFI=0.98, NFI=0.97, RFI=0.95, RMSEA=0.07<0.08, which indicated that the model results had good validity. Previous studies have found that scales translated and validated in another society that have a good fit do not require any changes, which is consistent with the findings of the present study (Barati, Sadegh-Moghadam, Sajjadi, Nazari, & Bahri, 2019; Leila et al., 2016). The translated FHS-SF concepts of family health do not differ much from the original study and can be used in Chinese society.

Although entries were not removed in the study of the introduction of the Family Health Scale, not all scales translate so easily. For example, in a study of a cross-cultural nursing self-efficacy scale, Tian found that a 5-point Likert-type scale was more appropriate than the initially used 10-point Likert-type scale while removing entries for some of the flawed attributes for better use in Chinese society (Tian, Wang, Xu, & He, 2021). In addition to this, in another study of translation and cultural accommodation for the Bayley-III Expressive Intercourse Scale, not only four items were deleted, but 12 items were revised and 12 items were added (BangHeeJeong, Lee, & 김희정, 2009). This phenomenon was also explained by Akram et al. in their study, who concluded that the differences between the translated scale and the original text depended on several factors, such as the concept of the study, the development of the original instrument method and accuracy, use of language, cultural differences, and other factors (Kharazmi, Brant, Sajjadi, Moshki, & Moghadam, 2020).

## 4.2 Shortcomings and outlook

There are still some shortcomings in this study: (i) the assessment tools for family health include not only the FHS, but also the Family Assessment Scale, the Family Adaptability and Cohesion Evaluation Scale, and the Family Functioning Scale, which should be included in future studies to facilitate cross-sectional comparisons among multiple scales and to conduct criterion validity studies (de Beurs, Carlier, & van Hemert, 2021); (ii) the results of the chi-squared degrees of freedom ratio for the validation factor analysis failed to reach a higher standard (less than 3), so the scale's structure needs further validation; (iii) This study did not compare a Long Form of the Family Health Scale with the Short Form, and future studies should further examine the structure and reliability of the Chinese version a Long Form of the Family Health Scale.

## 5 Conclusions

In conclusion, our study shows that the Chinese version of the FHS-SF has good internal consistency and excellent test-retest reliability. In addition, our findings suggest that the Chinese version of the FHS-SF is a

reliable and valid tool for assessing family health.

## Declarations

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**Author contributions** Fei Wang and Yunchuo Wu contributed equally to the study and therefore share first authorship. All authors contributed to the study conception, design, and analysis plan. Fei Wang analyzed the data. Fei Wang and Yunchuo Wu prepared the first draft of the manuscript. Both Xinying Sun and Yibo Wu participated in and supervised this study throughout, and they contributed equally to the paper. All authors commented on previous versions of the manuscript and approved the final version.

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**Data availability** The data that support the findings of this study are available from the corresponding author upon reasonable request.

**Consent for publication** Not applicable.

**Conflict of interest** The authors have no relevant financial or non-financial interests to disclose.

**Ethical approval** According to the ministry of health "involves people of biomedical research ethics review method (try out)", the national drug supervision and administration of the quality control standard for clinical trials (2003), the medical instrument clinical trial regulations (2004), the world medical association declaration of Helsinki and the human body biomedical research international moral guide ethical principles, this study passed the ethical review (JNUKY-2021-018). We certify that all applicable institutional and governmental regulations concerning the ethical use of human volunteers were followed over the course of this research.

**Consent to participate** All the Chinese version of the FHS-SF participants gave written informed consent.

**Consent for publication** Not applicable.

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