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## Translation and reliability and validity of the Chinese version of the Family Resilience Questionnaire

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# Translation and reliability and validity of the Chinese version of the Family Resilience Questionnaire

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## Abstract

**Objectives:** The objective of this study is to translate, adapt, and evaluate the Chinese version of Family Resilience Questionnaire and to measure the reliability and validity of the Chinese version of family resilience questionnaire among patients with breast cancer in China.

**Design:** It was a cross-sectional study, which involved translation, back-translation, adoption, and psychometric testing of an 24-item Likert-type family resilience measurement.

**Setting:** Three tertiary hospitals in Zhengzhou, China.

**Participants:** The reliability and validity of the Chinese version of FaRE Questionnaire was tested among 249 patients for the first sampling about exploratory factor analysis and 310 patients for the second sampling about Confirmatory factor analysis with breast cancer.

**Primary outcome measures:** Content validity was assessed by six experts. Construct validity test was performed using factor analysis. Cronbach's alpha was used to examine the internal consistency. The test-retest reliability was calculated using the intraclass correlation coefficient on

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3  
4 30 participants.  
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6

7 **Results:** For the Chinese version of FaRE questionnaire, the Scale-Content Validity Index  
8  
9 (S-CVI) was 0.97, and the Item-Content Validity Index (I-CVI) ranged from 0.83 to 1.00. The  
10  
11 questionnaire included 24 items, exploratory factor analysis extracted four factors with loading >  
12  
13 0.4, which could explain 72.146% of the total variance; Confirmatory factor analysis showed the  
14  
15 Chinese version of FaRE questionnaire had an excellent four-factor model consistent with the  
16  
17 original questionnaire. The Cronbach's  $\alpha$  coefficient of the total questionnaire was 0.909, and the  
18  
19 Cronbach's  $\alpha$  of four factors ranged from 0.902 to 0.963. The test-retest reliability coefficient of  
20  
21 the total questionnaire was 0.905.  
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28 **Conclusions:** The Chinese version of FaRE Questionnaire has acceptable reliability and validity  
29  
30 among patients with breast cancer. It can effectively assess the family resilience and provide basis  
31  
32 for personalized family resilience interventions for patients with breast cancer.  
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### 37 **Strengths and limitations of this study**

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40 ▶ To our knowledge, this was the first study on the psychometrics of the Chinese translation of  
41  
42 the FaRE Questionnaire.  
43  
44

45 ▶ Strict Chinesization procedures, sufficient sample size, Precise statistics methods.  
46  
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48 ▶ The findings of our study were only based on data from patients from three first-class hospitals  
49  
50 in Zhengzhou, which may not be representative of patients with breast cancer in mainland China  
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52 overall.  
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56 ▶ the selection of samples' targeted population and quantity may be biased to some extent  
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4 because of convenience sampling method.  
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7 ► Future studies should add other related factors to further assess the validity of the Chinese  
8  
9 version of FaRE questionnaire.  
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11

## 12 13 **Introduction** 14

15  
16 Breast cancer had the highest incidence in new cancer cases, whose morbidity  
17  
18 and mortality was respectively 24.2%, 15.0% in woman and topped the list  
19  
20 according to the latest global cancer statistics in 2018<sup>[1]</sup>. Among the malignant tumors  
21  
22 in China, breast cancer ranked the fifth, and breast cancer ranked the first among  
23  
24 female malignant tumors. Although the development of medical technology makes  
25  
26 the survival time of breast cancer patients significantly prolonged<sup>[2]</sup>, diagnosis of  
27  
28 breast cancer, mastectomy and long-term postoperative chemoradiotherapy also  
29  
30 inevitably lead to severe adverse stress reactions. Meanwhile, breast cancer is not just  
31  
32 a personal event, it is also a more important family event<sup>[3]</sup>. According to  
33  
34 Bowen family systems theory<sup>[4]</sup>, cancer diagnosis and related clinical treatment of a  
35  
36 family member may cause patients and their families to be in a state of adverse and  
37  
38 high stress, and ultimately affect the stability and balance of the whole family  
39  
40 system<sup>[5]</sup>. Previous studies on family stress of breast cancer patients mostly focused  
41  
42 on negative emotions of breast cancer patients such as anxiety, pessimism, fear<sup>[6-7]</sup> and  
43  
44 depression<sup>[8]</sup> and descending quality of life<sup>[9]</sup>, the psychological distress<sup>[10]</sup>, physical  
45  
46 burden<sup>[11]</sup>, psychosocial burden and economic burden<sup>[12]</sup> of the family members of  
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48 breast cancer patients, as well as a variety of adverse family stress reactions including  
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4 family dysfunction<sup>[13-14]</sup> and reduced family life quality of breast cancer patients<sup>[15]</sup>.  
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7         With the proposing of family systems theory and the rising of positive  
8  
9  
10         psychology, while discussing the negative impact of cancer on the whole family,  
11  
12         domestic and foreign scholars also found that families of cancer patients have positive  
13  
14         resilience<sup>[16]</sup>. Current researches shows that the focus of research on family stress of  
15  
16         cancer patients has gradually shifted to the strength and power of family, namely,  
17  
18         family resilience, which has been widely used in psychology and nursing<sup>[17,18]</sup>.  
19  
20         Compared with other types of cancer, breast cancer has more significant impacts on  
21  
22         patients, their spouses, family members, conjugal relationships and family function.  
23  
24         Thus, for breast cancer patients, family resilience may provide a new theoretical basis  
25  
26         for the prevention and intervention of family crisis. Therefore it is important to  
27  
28         accurately assess the family resilience of breast cancer. However, domestic research  
29  
30         about family resilience of breast cancer in China is less, and there is still a lack of  
31  
32         effective assessment tools. Family Resilience Questionnaire was compiled based on  
33  
34         Walsh Family Resilience Model by Italian scholar Faccio et al<sup>[19]</sup>, including 24 items  
35  
36         and 4 dimensions involving communication and cohesion, perceived social support,  
37  
38         perceived family coping, religiousness and spirituality. The Family Resilience  
39  
40         Questionnaire is used to measure breast cancer patients' family resilience, more  
41  
42         specifically, the family dynamics and resources, estimating the adaptation flexibility  
43  
44         to cancer disease. The questionnaire has been tested in breast cancer patients in Italy  
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46         and has good reliability and validity. The purpose of our study is to provide an  
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48         effective tool for assessing the family resilience of Chinese breast cancer patients by  
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4 translating and cross-cultural adaptation of FaRE questionnaire.  
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## 7 **Methods**

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### 10 **Design, participants and setting**

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14 It was a cross-sectional study. A convenience sample of patients with breast  
15 cancer was recruited from three first-class hospitals in Zhengzhou from December  
16 2019 to February 2020 and From August 2020 to September 2020. Data were  
17 collected in two sampling sessions. The first sampling was used for exploratory factor  
18 analysis, and 249 valid questionnaires were collected The second sampling was used  
19 for confirmatory factor analysis, and 310 cases of valid questionnaires were collected.  
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30 Criteria for inclusion were as follows: (1) Histopathological examination  
31 confirms breast cancer; (2) aged 18 years or older; (3) able to read and write Chinese;  
32  
33 (4) Informed consent and voluntary participation in the study; Criteria for exclusion  
34 were as follows: (1) sufferers with mental disorders and communication difficulties;  
35  
36 (2) no history of other serious life-threatening diseases.  
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### 44 **Measurements**

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48 Demographic characteristics and clinical data were collected using General  
49 Information Questionnaire, Chinese version of the Family Resilience Questionnaire.  
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53 **General Information Questionnaire.** It's a self design questionnaire, which included  
54 some questions on age, religious faith, marital status, education, occupation,  
55 Household per capita monthly income, Long-term residence, primary caregiver,  
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4 living situation, payment manner of the medical expenses, treatment of disease,  
5  
6 surgery way, complication, family history of disease.  
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10 **Chinese version of the Family Resilience Questionnaire.** The questionnaire was  
11  
12 developed by Faccio Italy in 2019 according to the Walsh Family Resilience Model  
13  
14 based on breast cancer and prostate cancer patients<sup>[19]</sup>. It comprises 24 items  
15  
16 measuring four dimensions of communication and cohesion(8 items), perceived social  
17  
18 support(8 items), perceived family coping(4 items), religiousness and spirituality(4  
19  
20 items). The Cronbach'α coefficient of four dimension was 0.88, 0.88, 0.82 and 0.86  
21  
22 respectively in the original questionnaire, and it had good reliability and validity.  
23  
24 Questionnaire respondents indicate to what extent they agree with the items on a  
25  
26 seven-point scale from 'strongly disagree' (scored 1) to 'strongly agree'(scored 7).  
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28 Higher scores on the FaRE questionnaire reflect higher family resilience levels.  
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36 The FaRE questionnaire in the study has been authorized by the original author  
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38 Professor Faccio. The questionnaire was translated into Chinese and adapted  
39  
40 cross-culturally using Brislin translation pattern<sup>[20]</sup>. The translation process was as  
41  
42 follows<sup>[21]</sup>: (1) Forward translation: two translator who are respectively a bilingual  
43  
44 graduate student and a bilingual PhD student independently translated the FaRE  
45  
46 questionnaire from English into Chinese; (2) Proofreading: the research group  
47  
48 compared the two Chinese versions and maked modifications and adjustments to form  
49  
50 a harmonized version of the two translated versions; (3) Back translation: two  
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52 graduate students majored in English who didn't see the original English version of  
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54 the questionnaire independently translated the FaRE questionnaire from Chinese into  
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4 English. On the premise of being faithful to the original questionnaire, researchers  
5  
6 carried out forward translation and back translation again regarding to the sentences  
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8 with a semantic consistency rate of less than 70% until the semantic consistency rate  
9  
10 reaches more than 90%. (4) Cross-cultural adaptation: Expert panel including two  
11  
12 psychologists, two specialists in clinical medicine, two specialists in clinical nursing  
13  
14 independently reviewed the original, proofread and translated version of the  
15  
16 questionnaire to give their opinions on the cultural equivalency and the  
17  
18 appropriateness of the language translation. And they were asked to rate each item on  
19  
20 a four-point Likert type scale ranging from 1 (uncorrelated) to 4 (strongly correlated)  
21  
22 so as to evaluate the content validity of the questionnaire. The researchers will choose  
23  
24 the most appropriate way of Chinese expression according to the suggestions. (5)  
25  
26 Pretest: 30 breast cancer patients were interviewed in depth about their understanding  
27  
28 of the items, and the items with vague semantics and difficult to understand were  
29  
30 timely modified. (6) Combined with the results of expert consultation and pretest,  
31  
32 form a final Chinese version of the Family Resilience Questionnaire.  
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### 44 **Procedure**

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47 The study was approved by the Ethics Committee of Zhengzhou University  
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49 (ZZURIB 2020-19) and all patients involved provided informed written consent.  
50  
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52 During the survey, the researchers explained the purpose of the study and the filling  
53  
54 method of the questionnaire to the patients in the unified training language. The  
55  
56 General Information Questionnaire and Chinese version of the Family Resilience  
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58 Questionnaire were administered to each breast patients. All patients could complete  
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4 the questionnaire by themselves. Every survey took about 10-20 min to complete.  
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7 Finally, a subgroup of 30 patients with breast cancer were interviewed again at  
8  
9 the clinic for two week after the initial interview to assess the reproducibility  
10  
11 (test-retest reliability) of the FaRE questionnaire.  
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## 15 **Data processing and statistical analysis**

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19 IBM SPSS software version 21.0 and AMOS software version 21.0 were used  
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21 for the statistical analysis. Descriptive statistics were used to summarize the breast  
22  
23 cancer patients' demographic characteristics. Item analysis, validity and reliability of  
24  
25 the questionnaire were assessed.  
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### 30 **(1) Item analysis**

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34 It means to analyze and test the quality of each item, whose purpose is to test the  
35  
36 the suitability or reliability of instruments and individual items. Its results can be used  
37  
38 as the basis for the screening or modification of individual items, so as to enhance the  
39  
40 effectiveness of the questionnaire for the subjects. In this study, the critical value  
41  
42 method and item total score correlation method were used for item analysis. The  
43  
44 items with correlation coefficient less than 0.4 or not reaching the significant level  
45  
46 were deleted<sup>[22]</sup>.  
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### 52 **(2) Validity**

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56 Content validity of the questionnaire was assessed by expert consultation, which was  
57  
58 assessed using the item-level content validity index (I-CVI) and the scale-level  
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4 content validity index (S-CVI) by calculating the agreement proportion of items from  
5  
6 all the experts.  
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9  
10 The explanatory factor analysis and confirmatory factor analysis were used to  
11  
12 assess construct validity<sup>[23]</sup>. the Kaise-Meyer-Olkin (KMO) test and Bartlett's  $\chi^2$  test  
13  
14 were first used to examine the suitability of the data for factor analysis. For the  
15  
16 explanatory factor analysis, the load more than 0.4 of the item on a factor was used as  
17  
18 a factor attribution criterion, on the contrary or if there was a double load, the item  
19  
20 would be deleted<sup>[22]</sup>. Confirmatory factor analysis was used to examine Questionnaire  
21  
22 four-factor model. Chi-square degree of freedom ratio, Root Mean Square Residual,  
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24 Goodness of fit index, Comparative fit index, Incremental fit index as well as Root  
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26 Mean Square Error Approximate were used to evaluate the model<sup>[22]</sup>.  
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34 All analyses used two-tailed  $p$  values , and  $p < 0.05$  was considered statistically  
35  
36 significant.  
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### 39 40 **(3) Reliability**

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43 Internal consistency referred to the items' homogeneity and internal correlation  
44  
45 between instruments, which was assessed using the Cronbach's  $\alpha$  coefficient. Scores  
46  
47 greater than or equal to 0.7 were considered acceptable<sup>[24]</sup>. More scores indicated  
48  
49 more excellent internal consistency.  
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54 Test-retest reliability was used to reflect the temporal stability of the  
55  
56 questionnaire by calculating the pearson correlation coefficient of the total score and  
57  
58 each factor. Scores of 0.70-0.89 were considered strong and those higher than 0.90  
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4 were considered very strong.  
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## 7 **Results**

### 10 **Demographic and clinical characteristics**

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13  
14 All the breast cancer patients were female. The patients' age of the first sampling  
15 was 20~78 (45.77±10.09) years old, and the second sampling was 22~73  
16 (45.7±10.213) years old. Demographic and clinical characteristics of the sample were  
17  
18  
19  
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21  
22 shown in Table 1.  
23

### 25 **Cross-cultural adaption**

26  
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28 During the expert consultation process, a psychologist believed the Chinese  
29 expression of item 3 'We can deal this illness as a family' was hard to understand. He  
30 suggested to change it by a substitute word and adjusting the word order. Another  
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During the pretesting, almost all patients thought the Chinese expressions of item  
background.

During the pretesting, almost all patients thought the Chinese expressions of item

1 'We understand each other with regard to the experience of illness we are living'  
was inappropriate and hard to understand. To clarify the meaning of this item for the  
participants, after communicating with the original author, we did some amendment.

### Item analysis

**correlation analysis.** The correlation analysis showed that the correlation coefficient between the score of each item and the total score of the questionnaire was 0.437~0.712 ( $P<0.01$ ), both greater than 0.4. Thus, all items were reserved.

**Extreme Value Method.** CR value was used as the test index to analyze the distinction between entries in the Chinese version of the family resilience questionnaire. It showed that the differences among all items were statistically significant ( $P<0.01$ ).

### Validity

**Content validity.** For the expert panel, the scale-level content validity index (S-CVI) was 0.97, and item-level content validity index (I-CVI) ranged from 0.83 to 1.00.

**Construct validity.** For exploratory factor analysis, the KMO value was 0.907, indicating that the data were suitable for factor analysis, and Bartlett's test of sphericity was 5006.376 ( $P<0.001$ ), suggesting that extraction of common factors could explain most of the statistical information which questionnaire entries represented<sup>[22]</sup>. Four common factors with eigenvalue  $> 1$  were extracted by principal component analysis, which could explain 72.146% of the total variance. The load of

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4 each item on its dimension in the component matrix was  $> 0.40$  (minimum  
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6 value:0.476; maximum value:0.968) by maximum variance orthogonal rotation. The  
7  
8 final four common factors extracted in this study were consistent with the original  
9  
10 questionnaire. Factor 1 was named Communication and cohesion, Factor 2 was  
11  
12 named Perceived social support, Factor 3 was named Perceived family coping and  
13  
14 factor 4 was named Religiousness and Spirituality. See the component matrix of each  
15  
16 factor in Table 2.  
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23 To further verify the structural validity of the questionnaire, 310 samples were  
24  
25 subjected to confirmatory factor analysis using AMOS 21.0 software. According to  
26  
27 the structure and dimension of the original questionnaire, Communication and  
28  
29 cohesion, Perceived social support, Perceived family coping and Religiousness and  
30  
31 Spirituality were set as four latent variables. And the factor structure including 24  
32  
33 items was set as observation variable to establish a preset model of confirmatory  
34  
35 factor analysis.  
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42 Normality test for the collected data showed that each item's skewness index  
43  
44 was far  $< 3$ , kurtosis index of was far  $< 8$ . The data were in accordance with normal  
45  
46 distribution. Therefore, maximum likelihood method was adopted to estimate the  
47  
48 parameter model. The initial model fitting results were shown in Figure 1.  
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53 The fitting indexes of initial model were not ideal, which indicated the deviation  
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55 between the default model and the actual observation data. It needed to be revised.  
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59 The model was revised on the basis of the original hypothesis model.  
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4 Modification index of the model was defined as 4. If modification index was greater  
5  
6 than 4, it meant that the model needed to be modified. Fitting indexes both were  
7  
8 greater than 0.9 after the modification of default model, which reached an acceptable  
9  
10 range (Figure2). See Table 3 for the fitting indexes before and after the modification.  
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## 14 15 **Reliability**

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18 **Internal consistency.** The Cronbach's  $\alpha$  coefficients for the total Chinese version of  
19  
20 Family Resilience Questionnaire was 0.909. Cronbach's  $\alpha$  coefficients of four factors  
21  
22 respectively were 0.902, 0.932, 0.905, 0.963.  
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26  
27 **Test-retest reliability.** The test-retest reliability for the total Chinese version of  
28  
29 Family Resilience Questionnaire was 0.905, which respectively were 0.952, 0.949,  
30  
31 0.968, 0.942.  
32  
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## 34 35 **Discussion**

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38 The FaRE Questionnaire is an instrument designed to measure family resilience  
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40 among patients with cancer<sup>19</sup>. The study was conducted to determine whether the  
41  
42 FaRE Questionnaire could be used among Chinese patients with breast cancer in  
43  
44 mainland China. Through literature review, Chinese research status of family  
45  
46 resilience was not profound enough, specially for patients with breast cancer.  
47  
48 Accurately assessing the family resilience of breast cancer patients is the basis. A  
49  
50 recent review showed that instruments for family resilience in patients with breast  
51  
52 cancer lacked localization<sup>[26]</sup>. Thus we translated the FaRE Questionnaire into Chinese  
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54 using forward and back-translation, expert review, cultural adaption and pilot testing  
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4 seriously to make sure the semantic equivalence and intelligibility of the Chinese  
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6 version of the questionnaire. We also examined the reliability and validity of the  
7  
8 Chinese version of FaRE Questionnaire using item analysis, reliability, content  
9  
10 validity, exploratory factor analysis, confirmatory factor analysis.  
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14

15 Previously, the original Italy version of the questionnaire was proved to be  
16  
17 reliable and valid among a total of 213 patients with a histologically confirmed  
18  
19 non-metastatic breast or prostate cancer. Nevertheless, patients' lifestyles and cultural  
20  
21 backgrounds in China are different from Italy. Our study suggested that the FaRE  
22  
23 Questionnaire can be adapted to Chinese cultures, which had excellent content  
24  
25 validity and construct validity as well as high internal consistency reliability and  
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27 test-retest reliability among patients with breast cancer.  
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34 Item analysis showed that correlation coefficients between the score of each  
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36 item and the total score of the questionnaire were both greater than 0.4 and CR value  
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38 also were statistically significant, indicating suitability or reliability of items.  
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43 Results of our study shown that the FaRE Questionnaire had a good content  
44  
45 validity, indicating that the questionnaire can accurately reflect the family resilience  
46  
47 of patients with breast cancer. Exploratory factor analysis and confirmatory factor  
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49 analysis were conducted on the large-scale samples to examine the construct validity.  
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51 For exploratory factor analysis, the analyses results indicated that all the items had  
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53 factor loading  $>0.476$ , meeting the criterion for significance. For confirmatory factor  
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55 analysis, the results indicated a four-factor structure consistent with the original Italy  
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4 version. These indicated that the validity of the Chinese version of the FaRE  
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version. These indicated that the validity of the Chinese version of the FaRE Questionnaire was relatively stable and was consistent with the tabulation theory.

Cronbach's  $\alpha$  coefficient for the total FaRE Questionnaire was 0.909 for the including sample, and Cronbach's  $\alpha$  coefficients of four factors were respectively 0.90, 0.932, 0.905, 0.963, indicating high internal consistency reliability of the Chinese version of FaRE Questionnaire. This finding was higher than Cronbach's  $\alpha$  for the Italy population<sup>[18]</sup>. The Chinese version of FaRE Questionnaire also had a high test–retest reliability, indicating good time stability in breast cancer patients.

As a global public health problem threatening women' health, breast cancer has more significant impacts on patients, their spouses, family members, conjugal relationships and family function. Family resilience emphasizes how the family as a system can cope with stress and adversity to help the family achieve good adjustment and adaptation. It is imperative to pay attention to the family resilience of breast cancer patients. The Chinese version of FaRE questionnaire finally formed in this study has been subjected to strict reliability and validity test. The preliminary results also show that the questionnaire can scientifically and effectively evaluate the family resilience of breast cancer patients in mainland China. The Chinese version of FaRE questionnaire has satisfactory validity and reliability for use among patients with breast cancer in mainland China. Further research can use the instrument to assess the family resilience of breast cancer patients, and on this basis provide personalized and scientific family resilience intervention.

## Conclusions

The results of this study suggest that the Chinese version of FaRE Questionnaire is a valid and reliable instrument. It can effectively assess the family resilience and provide basis for personalized family resilience interventions for patients with breast cancer.

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## Contributors

Mengmeng LI and Huashan YANG contributes equally to this work—conceptualisation, methodology, software, reliability, validation, formal analysis, investigation, data curation, writing (original draft), writing (review and editing). Peng WANG—conceptualisation, methodology, writing (review and editing). Jiawei JIAO, Lamei LIU, Panpan WANG—conceptualisation, investigation, resources. Zhenxiang ZHANG, Shiguang WANG—conceptualisation, supervision, project administration and funding acquisition and writing (review and editing).

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17  
18 **Patient and public involvement** Patients and/or the public were not involved in the design, or  
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21 conduct, or reporting, or dissemination plans of this research.  
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25 **Patient consent for publication** Not required.  
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31 The Ethics Committee of Zhengzhou University has approved the study(ZZURIB 2020-19).  
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42

#### 43 44 **Declaration of conflicting interests**

45  
46  
47 We have read and understood BMJ policy on declaration of interests and declare that we have no  
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50 competing interests.  
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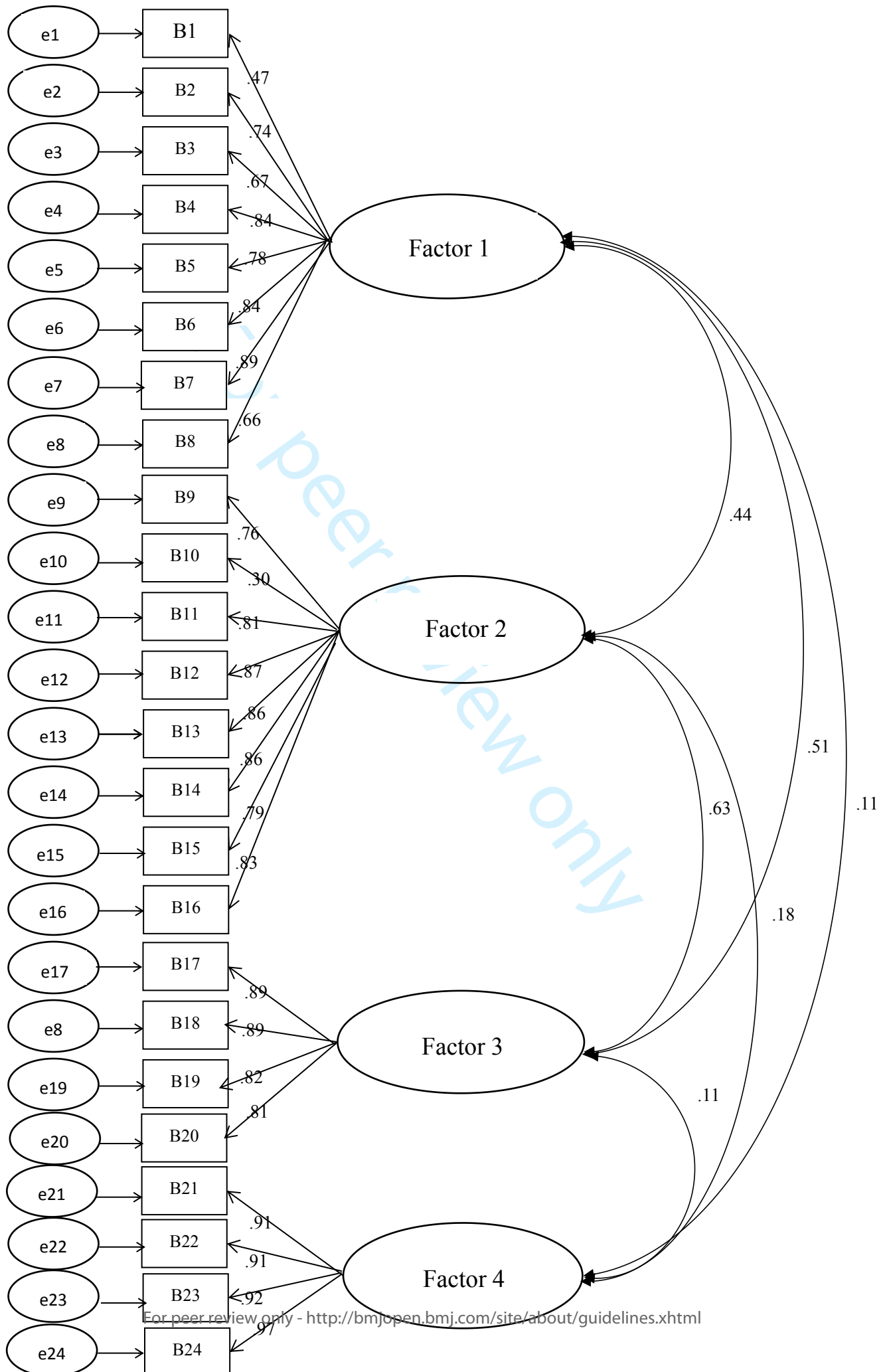
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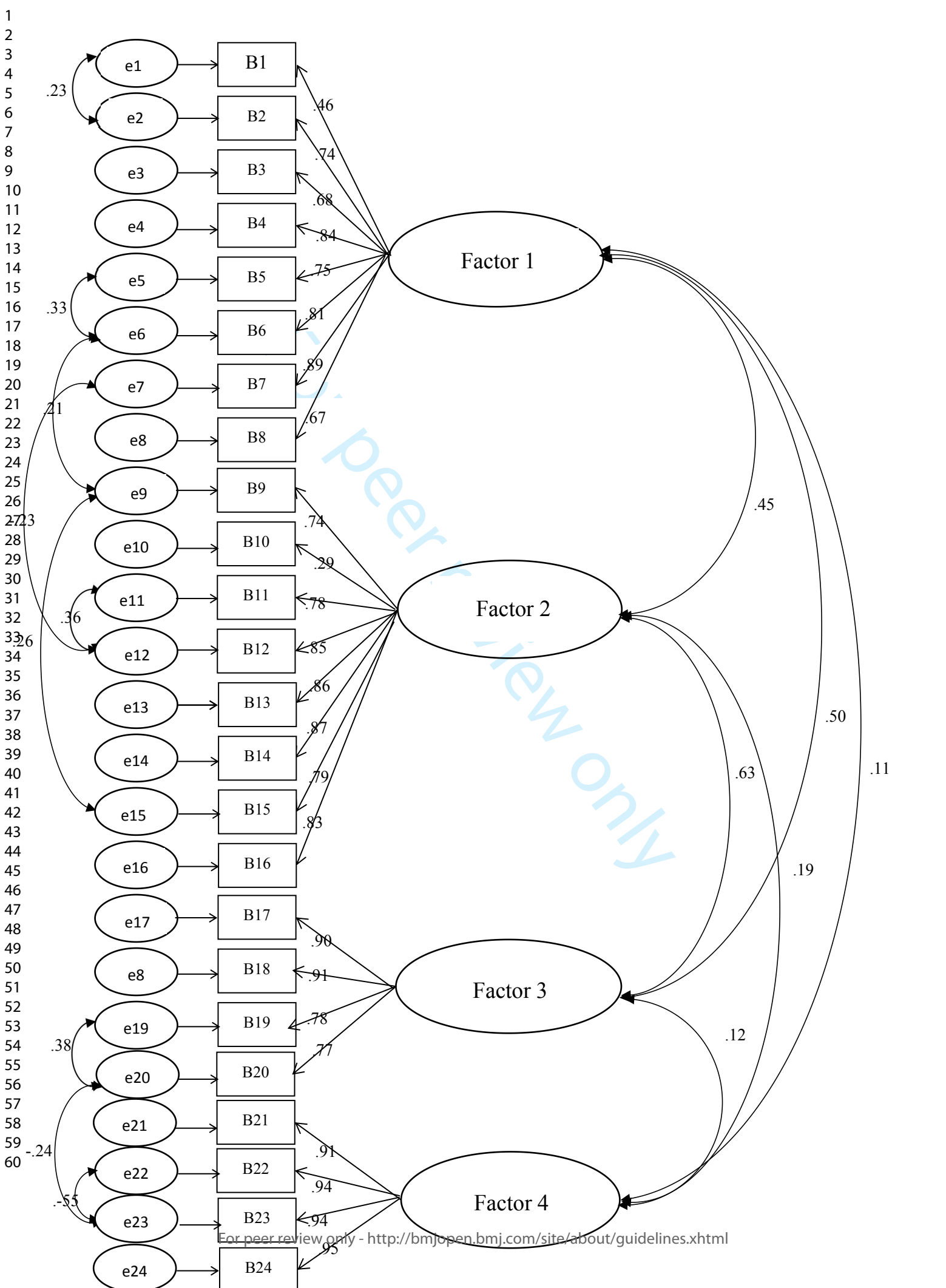
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**Figure 1 Fitting figure of default model of Chinese version of FaRE Questionnaire**

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**Figure 2 Fitting figure of modification model of the Chinese version of FaRE Questionnaire**

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**Table 1. Characteristics of the participants from two sampling**

Category	First sampling (n=249)	Second sampling (n=310)
Marital status		
Single	10 (4)	15 (4.8)
Married	232 (93.2)	286 (92.3)
Education		
Divorced or widowed	7 (2.8)	9 (2.9)
Bachelor or above	31 (12.4)	37 (11.9)
Diploma	31 (12.4)	36 (11.6)
High school, technical secondary	48 (19.3)	59 (19.0)
Occupation		
Middle school	139 (55.8)	178 (57.4)
On job	59 (23.7)	70 (22.6)
Sick rest	23 (9.2)	28 (9.0)
Retirement	34 (13.7)	39 (12.6)
Unemployed or otherwise	133 (53.4)	173 (55.8)
Household per capita monthly income		
Less than 2000 RMB	93 (37.3)	119 (38.4)
2000-3999 RMB	97 (39)	118 (38.1)
More than 4000 RMB	59 (23.7)	70 (22.6)
Long-term residence		
Country	117 (47)	150 (48.4)
Cities and towns	132 (53)	160 (51.6)
Primary caregiver		
Spouse	146 (58.6)	181 (58.4)
Sons and daughters	58 (23.3)	70 (22.6)
Parents	21 (8.4)	26 (8.4)
Oneself	15 (6)	20 (6.5)
Other	9 (3.6)	13 (4.2)
Living situation		
Live by oneself	7 (2.8)	8 (2.6)
Spouse cohabitation	190 (76.3)	237 (76.5)
Two generations live together	19 (7.6)	22 (7.1)
Big family	29 (11.6)	38 (12.3)
Other	4 (1.6)	5 (1.6)
Medical expenses payment manner		
Medical insurance	95 (38.2)	116 (37.4)
Rural cooperative medical care	140 (56.2)	178 (57.4)
Self pay	14 (5.6)	16 (5.2)
Treatment of disease		
Surgery/ Chemotherapy	214 (85.9)	266 (85.8)
Surgery /Chemotherapy/ Radiotherapy	25 (10)	32 (10.3)
Surgery/ Chemotherapy /Radiotherapy	3 (1.2)	3 (1.0)

Endocrinotherapy			
Surgery /Chemotherapy /Radiotherapy	3 (1.2)	4 (1.3)	
/Molecular targeting treatment			
Surgery/ Chemotherapy/ Radiotherapy/	1 (0.4)	1 (0.3)	
Endocrinotherapy /Molecular targeting			
treatment			
Surgery/Chemotherapy/Endocrinotherapy	1 (0.4)	1 (0.3)	
Surgery /Chemotherapy/Molecular targeting	2 (0.8)	3 (1.0)	
treatment			
Surgery way			
Breast conserving surgery	68 (27.3)	91 (29.4)	
Modified radical operation	25 (10)	28 (9.0)	
Mastectomy	156 (62.7)	191 (61.6)	
Complications			
No	238 (95.6)	298 (96.1)	
Yes	11 (4.4)	12 (3.9)	
Family history of disease			
No	245 (98.4)	304 (98.1)	
Yes	4 (1.6)	6 (1.9)	

**Table 2 Factor loading matrix after rotation in the Chinese version of FaRE Questionnaire**

Factor	Item	principal component			
		Factor 1	Factor 2	Factor3	Factor 4
Communication and cohesion	B7 Everyone in the family is open to listening other's opinions regarding the illness	<b>.841</b>	.173	.183	.046
	B4 We discuss the illness-related problems until we find a shared solution	<b>.834</b>	.139	.106	.070
	B6 We are honest when talking about the illness amongst ourselves	<b>.807</b>	.178	.136	.038
	B5 Everyone in the family feels free to express their own opinion regarding the illness	<b>.787</b>	.132	.118	.096
	B2 In our family we feel that we can talk about how to communicate between us	<b>.775</b>	.036	.212	.056
	B3 We can deal this illness as a family	<b>.732</b>	.165	.115	.055
	B8 The things we do for each other in dealing with this illness make us feel part of the family	<b>.688</b>	.120	.175	.011
	B1 We understand each other with regard	<b>.476</b>	.245	.116	-.009

		to the experience of illness we are living				
	Perceived social support	B15 We receive gifts and favours from our closest friends	.076	<b>.824</b>	.125	.044
		B12 We feels that our closest friends would be happy to support us emotionally in managing the illness	.249	<b>.804</b>	.185	.077
		B14 We know we are important for our friends	.182	<b>.801</b>	.254	.040
		B10 We can rely on our close friends to help us deal this illness	.035	<b>.797</b>	.047	-.001
		B9 We ask our closest friends to help and assist us in this battle against the illness	.185	<b>.790</b>	.120	.110
		B13 We know that if we need comfort, our closest friends will be there for us	.189	<b>.788</b>	.258	.095
		B11 We feel that the people in our social network would be happy to support us emotionally in dealing the illness	.173	<b>.788</b>	.170	.052
		B16 Our friends respect our family for how we reacted to the illness	.241	<b>.780</b>	.222	.076
	Perceived social support	B17 We believe that we can manage the illness	.259	.266	<b>.818</b>	-.004
		B18 We can solve important problems in our life such as this illness	.216	.313	<b>.815</b>	.032
		B19 We feel we are strong enough to cope with this illness	.300	.204	<b>.804</b>	.044
		B20 We have the strength to solve our problem	.231	.271	<b>.780</b>	.084
	Religiousness and Spirituality	B24 We ask our religious/spiritual reference figure for advice or words of comfort about the illness	.059	.055	.019	<b>.968</b>
		B21 We attend the church / synagogue / mosque/other places of worship	.074	.101	.034	<b>.938</b>
		B23 We participate in the activities of our religious community	.041	.060	.032	<b>.935</b>
		B22 We believe there is a supreme spiritual being that will help us deal this illness	.081	.098	.053	<b>.933</b>
		Eigenvalues	3.423	9.149	1.638	3.105
		Cumulative variance tribute rate (%)	38.120	52.383	65.320	72.146



**Table 3 Fitting indexes before and after the model modification**

Indexes	$\chi^2/df$	RMR	GFI	CFI	IFI	NFI	RMSEA
before modification	2.478	0.09	0.851	0.938	0.938	0.900	0.069
after modification	1.697	0.039	0.912	0.972	0.972	0.934	0.048
reference standards	1~3	<0.05	>0.90	>0.90	>0.90	>0.90	<0.05 very good <0.08 good <0.10 fair

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# BMJ Open

## Reliability and validity of the Chinese version of the Family Resilience Questionnaire (FaRE Questionnaire) in patients with breast cancer: a cross-sectional study

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Secondary Subject Heading:	Nursing, Health services research, Oncology
Keywords:	ONCOLOGY, PSYCHIATRY, Health policy < HEALTH SERVICES ADMINISTRATION & MANAGEMENT

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## Title page

**Title:** Reliability and validity of the Chinese version of the Family Resilience Questionnaire (FaRE Questionnaire) in patients with breast cancer: a cross-sectional study

**Author:** Mengmeng Li<sup>1,2#</sup>, Rui Ma<sup>3#</sup>, Shanfeng Zhang<sup>4#</sup>, Shanshan Wang<sup>1</sup>, Jiawei Jiao<sup>1</sup>, Lamei Liu<sup>1</sup>, Panpan Wang<sup>1</sup>, Zhenxiang Zhang<sup>1</sup>, Peng Wang<sup>1\*</sup>

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**Keywords:** breast cancer; family resilience; nursing; healthcare

**Word count:** 4000

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4 **Reliability and validity of the Chinese version of the Family Resilience**  
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6 **Questionnaire (FaRE Questionnaire) in patients with breast cancer: a**  
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8 **cross-sectional study**  
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11 **ABSTRACT**  
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14 **Objective** The objective of this study is to translate, adapt, and evaluate the Chinese version of  
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16 Family Resilience Questionnaire and to measure the reliability and validity of the instrument  
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18 among patients with breast cancer in China.  
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22 **Design** It was a cross-sectional study, which involved translation, back-translation, adaption, and  
23  
24 psychometric testing of a 24-item Likert-type family resilience measurement.  
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27 **Setting** Three tertiary hospitals in Zhengzhou, China.  
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30 **Participants** A total of 559 patients with breast cancer completed the study.  
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33 **Primary outcome measures** The primary outcome measures considered in this study were FaRE  
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35 Questionnaire and General Information Questionnaire. Cronbach's  $\alpha$  coefficient was used to  
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37 examine the internal consistency. The test-retest reliability was calculated using the intraclass  
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39 correlation coefficient on 30 participants. Content validity was assessed by six experts. Construct  
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41 validity test was performed using factor analysis including exploratory factor analysis and  
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43 confirmatory factor analysis.  
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48 **Results** For the Chinese version of FaRE questionnaire, the Cronbach's  $\alpha$  coefficient of the total  
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50 questionnaire was 0.909, and the Cronbach's  $\alpha$  coefficients of four factors ranged from 0.902 to  
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52 0.963. The test-retest reliability coefficient of the total questionnaire was 0.905. The  
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54 Scale-Content Validity Index (S-CVI) was 0.97, and Item-Content Validity Index (I-CVI) ranged  
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56 from 0.83 to 1.00. The questionnaire included 24 items, exploratory factor analysis extracted four  
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factors with loading > 0.4, which could explain 72.146% of the total variance. Confirmatory factor analysis showed the Chinese version of FaRE questionnaire had an excellent four-factor model consistent with the original questionnaire.

**Conclusion** The Chinese version of FaRE Questionnaire has acceptable reliability and validity among patients with breast cancer in China. It can effectively assess family resilience and provide basis for personalized family resilience interventions for patients with breast cancer.

#### **Strengths and limitations of this study**

- ▶ To our knowledge, this was the first study on the psychometrics of the Chinese translation of the FaRE Questionnaire.
- ▶ Strict Chinesization procedures, sufficient sample size, Precise statistics methods.
- ▶ The findings of our study were only based on data from patients from three hospitals in Zhengzhou, which may not be representative of patients with breast cancer in mainland China.
- ▶ Convergent validity assessment and evaluation of sensitivity of 4 factors will be considered.

#### **Introduction**

Breast cancer had the highest incidence in new cancer cases, whose morbidity and mortality were respectively 24.2%, 15.0% in women and topped the list according to the latest global cancer statistics in 2018<sup>[1]</sup>. Among the malignant tumors in China, breast cancer ranked fifth, and breast cancer ranked first among female malignant tumors. Although the development of medical technology makes the survival time of breast cancer patients significantly prolonged<sup>[2]</sup>, diagnosis of breast cancer, mastectomy and long-term postoperative chemoradiotherapy also inevitably lead to severe adverse stress reactions. Meanwhile, breast cancer is not just a personal

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4 event. It is also a more critical family event<sup>[3]</sup>. According to Bowen family systems  
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6 theory<sup>[4]</sup>, cancer diagnosis and related clinical treatment of a family member may  
7  
8 cause patients and their families to be in a state of adverse and high stress, and  
9  
10 ultimately affect the stability and balance of the whole family system<sup>[5]</sup>. Previous  
11  
12 studies on family stress of breast cancer patients mainly focused on two aspects. One  
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14 is negative emotions of patients with breast cancer such as anxiety, pessimism, fear<sup>[6-7]</sup>  
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16 and depression<sup>[8]</sup> and descending quality of life<sup>[9]</sup> and their family members'  
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18 psychological distress<sup>[10]</sup>, physical burden<sup>[11]</sup>, psychosocial burden and economic  
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20 burden<sup>[12]</sup>. Another is a variety of adverse family stress reactions including family  
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22 dysfunction<sup>[13-14]</sup> and reduced family life quality of patients with breast cancer<sup>[15]</sup>.

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30 With the proposing of family systems theory and the rising of positive  
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32 psychology, while discussing the negative impact of cancer on the whole family,  
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34 domestic and foreign scholars also found that families of cancer patients have positive  
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36 resilience<sup>[16]</sup>. Researches showed that the focus of research on family stress of cancer  
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38 patients has gradually shifted to the strength and power of family, namely, family  
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40 resilience, which has been widely used in psychology and nursing<sup>[17]</sup>. Family  
41  
42 resilience is defined as an attribute that helps families face changes, overcome  
43  
44 adversity and adapt to the crisis. Strong family resilience can not only improve the  
45  
46 physical and mental health of patients and their family members but also maintain  
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48 healthy family functions and ultimately promote a virtuous cycle of family  
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50 functions<sup>[18]</sup>. At the same time, compared with other types of cancer, breast cancer has  
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52 more significant impacts on patients, their spouses, family members, conjugal  
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4 relationships and family function<sup>[18]</sup>. Thus, for breast cancer patients, family resilience  
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6 may provide a new theoretical basis for interventions to improve family crisis.  
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9 Therefore it is vital to assess the family resilience of breast cancer accurately.

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11 However, domestic research on family resilience of patients with breast cancer in  
12  
13 China is less, and there is still a lack of effective assessment tools. Family Resilience  
14  
15 Questionnaire was compiled based on Walsh Family Resilience Model by Italian  
16  
17 scholar Faccio et al<sup>[19]</sup>. It includes 24 items and four dimensions: communication and  
18  
19 cohesion, perceived social support, perceived family coping, religiousness and  
20  
21 spirituality. The FaRE Questionnaire is used to measure family resilience, more  
22  
23 specifically, the family dynamics and resources and estimating the adaptation  
24  
25 flexibility to cancer disease. The questionnaire has been tested in patients with breast  
26  
27 cancer in Italy and has good reliability and validity<sup>[19]</sup>. Thus the purpose of our study  
28  
29 is to provide an effective tool for assessing the family resilience of Chinese breast  
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31 cancer patients by Chinese localization and psychometric testing of FaRE questionnaire.  
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## 40 **Methods**

### 41 **Study Design**

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43 The study is a cross-sectional study. The study was approved by the Ethics  
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45 Committee of Zhengzhou University (ZZURIB 2020-19) and all patients involved  
46  
47 provided informed written consent. In the study, patients with breast cancer were  
48  
49 recruited from three hospitals in Zhengzhou from December 2019 to February 2020  
50  
51 and From August 2020 to September 2020. The diagnosis criteria of breast cancer  
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53 were as follows: (1) histopathological examination confirms breast cancer; (2) aged  
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4 18 years or older; (3) able to read and write Chinese; (4) informed consent and  
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6 voluntary participation in the study. Criteria for exclusion were as follows: (1)  
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8 sufferers with mental disorders and communication difficulties; (2) no history of  
9  
10 other serious life-threatening diseases.  
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14 Data were collected in two sampling sessions. The first sampling was used for  
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16 item analysis, exploratory factor analysis, and internal consistency. The sample size  
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18 should be at least 5 to 10 times that of the questionnaire items<sup>[20]</sup>, our Questionnaire  
19  
20 contains 24 items. The study's sample size was calculated as 8 times of the items, and  
21  
22 the sample loss rate of 15% was taken into account. Therefore, the required sample  
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24 size was 221 cases. Actually, two hundred and forty-nine valid questionnaires were  
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26 collected in this section finally. In addition, clinical data from a subgroup of 30  
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28 patients from different age groups were collected again for two week after the initial  
29  
30 collection to assess the test-retest reliability of the FaRE questionnaire. The second  
31  
32 sampling was used for confirmatory factor analysis. It is generally believed that the  
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34 sample size required for confirmatory factor analysis should not be less than 300  
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36 cases<sup>[20]</sup>, 310 cases of valid questionnaires were collected finally.  
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### 45 **Measurements**

46  
47 Demographic characteristics and clinical data were collected using the General  
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49 Information Questionnaire, the Chinese version of the Family Resilience  
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51 Questionnaire.  
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55 **General Information Questionnaire.** It is a questionnaire designed by the research  
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57 team, which included some questions on age, religious faith, marital status, education,  
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4 occupation, Household per capita monthly income, Long-term residence, primary  
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6 caregiver, living situation, payment manner of the medical expenses, treatment of  
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8 disease, surgery way, complication, family history of the disease.  
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10  
11 **The Chinese version of the Family Resilience Questionnaire.** The questionnaire  
12  
13 was developed by Faccio in 2019 according to the Walsh Family Resilience Model  
14  
15 based on breast cancer and prostate cancer patients<sup>[19]</sup>. It comprises 24 items, and four  
16  
17 dimensions: communication and cohesion(8 items), perceived social support(8 items),  
18  
19 perceived family coping(4 items), religiousness and spirituality(4 items). The  
20  
21 Cronbach's  $\alpha$  coefficients of four dimensions were 0.88, 0.88, 0.82 and 0.86  
22  
23 respectively in the original questionnaire, and it had good reliability and validity.  
24  
25 Questionnaire respondents indicate to what extent they agree with the items on a  
26  
27 seven-point scale method from 'strongly disagree' (scored 1) to 'strongly  
28  
29 agree'(scored 7). Adding score of each item in the FaRE Questionnaire together can  
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31 get total scores. Higher scores on the FaRE questionnaire reflect higher family  
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33 resilience levels.  
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### 43 **Chinesization process**

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45 The use of the the FaRE questionnaire was authorized by the original author Professor  
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47 Faccio. The questionnaire was translated into Chinese and adapted cross-culturally  
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49 using the Brislin translation pattern<sup>[20]</sup>. The translation process was as follow<sup>s[21]</sup>: (1)  
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51 Forward translation: two translators, including a bilingual graduate student and a  
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53 bilingual Ph.D. student, independently translated the FaRE questionnaire from  
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55 English into Chinese; (2) Proofreading: our research group compared two different  
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4 Chinese versions and made modifications and adjustments to form a harmonized  
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6 version of two translated versions; (3) Back translation: two graduate students  
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8 majored in English who didn't see the original English version of the questionnaire  
9  
10 independently translated FaRE questionnaire from Chinese into English. On the  
11  
12 premise of being faithful to the original questionnaire, researchers carried out forward  
13  
14 translation and back translation again by comparing the translated English  
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16 questionnaire with the original one to make consistent. (4) Cross-cultural adaptation:  
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18 Expert panel including two psychologists, two specialists in clinical medicine, two  
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20 specialists in clinical nursing independently reviewed the original, proofread and  
21  
22 translated version of the questionnaire to give their opinions on cultural equivalency  
23  
24 and the appropriateness of language translation. Moreover, they were asked to rate  
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26 each item on a four-point Likert type scale ranging from 1 (uncorrelated) to 4  
27  
28 (strongly correlated) so as to evaluate the content validity of the questionnaire. The  
29  
30 researchers will choose the most appropriate way of Chinese expression according to  
31  
32 the suggestions. (5) Pretest: 30 breast cancer patients were interviewed in-depth about  
33  
34 their understanding of the items, and the items with vague semantics and difficult to  
35  
36 understand were timely modified. (6) Combined with the results of expert  
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38 consultation and pretest form a final Chinese version of the Family Resilience  
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40 Questionnaire.  
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### 53 **Data collection**

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55 During the survey, the researchers receiving standardized training explained the  
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57 purpose of the study and the filling method of the questionnaire to the patients in the  
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4 unified training language. The General Information Questionnaire and Chinese  
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6 version of the Family Resilience Questionnaire were administered to each breast  
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8 patient. All patients could complete the questionnaire by themselves. Every survey  
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10 took about 15-20 minutes to complete.  
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### 13 14 **Patient and public involvement statement**

15  
16 Patients or the public were not involved in the design, or conduct, or reporting, or dissemination  
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18 plans of this research. The patients were involved in the study by completing the  
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20 questionnaires face-to-face.  
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### 23 24 **Statistical analysis**

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26 IBM SPSS software version 21.0 and AMOS software version 21.0 were used for the  
27  
28 statistical analysis. Descriptive statistics were used to summarize the breast cancer  
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30 patients' demographic characteristics. Item analysis, validity and reliability of the  
31  
32 questionnaire were assessed. All analyses used two-tailed p values and  $p < 0.05$  was  
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34 considered statistically significant.  
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### 39 40 **Item analysis**

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42 It means to analyze and test the quality of each item, whose purpose is to test the  
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44 suitability or reliability of instruments and individual items. Its results can be used as  
45  
46 the basis for the screening or modification of individual items, to enhance the  
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48 effectiveness of the questionnaire for the subjects. In this study, the critical value  
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50 method and item-total score correlation method were used for item analysis. The  
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52 items with correlation coefficient less than 0.4 or not reaching the significant level  
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54 were deleted<sup>[22]</sup>.  
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### Reliability analysis

Internal consistency referred to the items' homogeneity and internal correlation between instruments, which was assessed using the Cronbach's  $\alpha$  coefficient. Scores greater than or equal to 0.7 were considered acceptable<sup>[23]</sup>. More scores indicated more excellent internal consistency.

Test-retest reliability was used to reflect the temporal stability of the questionnaire by calculating the Pearson correlation coefficient of the total score and each factor. Scores of 0.70-0.89 were considered strong, and those higher than 0.90 were considered very strong.

### Validity analysis

Content validity of the questionnaire was assessed by expert consultation, which was assessed using the item-level content validity index (I-CVI) and the scale-level content validity index (S-CVI) by calculating the agreement proportion of items from all the experts. Six experts rated the correlation between each item and its dimension of the Chinese family resilience questionnaire, 1 = not related, 2 = weak correlation, 3 = more relevant, 4 = very relevant. I-CVI means that each item appropriately reflect the extent of the concept to be measured, and S-CVI reflects the mean value of I-CVI of all items. I-CVI  $\geq$  0.78 and S-CVI  $\geq$  0.90 are considered acceptable<sup>[23]</sup>.

The exploratory factor analysis and confirmatory factor analysis were used to assess construct validity<sup>[24]</sup>. Kaise-Meyer-Olkin (KMO) test and Bartlett's  $\chi^2$  test were used to examine the suitability for factor analysis. For the explanatory factor analysis, a load of more than 0.4 of the item on a factor was used as a factor attribution

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4 criterion. Load less than 0.4 or double load was used as the criteria for deleting the  
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6 item would be deleted<sup>[22]</sup>. Confirmatory factor analysis was used to examine the  
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Questionnaire four-factor model. Chi-square degree of freedom ratio, Root Mean  
Square Residual, Goodness of fit index, Comparative fit index, Incremental fit index  
as well as Root Mean Square Error Approximate was used to evaluate the model<sup>[22]</sup>.

## Results

### Demographic and clinical characteristics

All the breast cancer patients were female. The patients' age of the first sampling was 20~78 (45.77±10.09) years old, and the second sampling was 22~73 (45.7±10.213) years old. The demographic and clinical characteristics of the sample were shown in Table 1.

Table 1 Characteristics of the participants from two sampling

Category	First sampling (n=249)	Second sampling (n=310)
Marital status		
Single	10 (4)	15 (4.8)
Married	232 (93.2)	286 (92.3)
Education		
Divorced or widowed	7 (2.8)	9 (2.9)
Bachelor or above	31 (12.4)	37 (11.9)
Diploma	31 (12.4)	36 (11.6)
High school, technical secondary	48 (19.3)	59 (19.0)
Occupation		
Middle school	139 (55.8)	178 (57.4)
On job	59 (23.7)	70 (22.6)
Sick rest	23 (9.2)	28 (9.0)
Retirement	34 (13.7)	39 (12.6)
Unemployed or otherwise	133 (53.4)	173 (55.8)
Household per capita monthly income		
Less than 2000 RMB	93 (37.3)	119 (38.4)
2000-3999 RMB	97 (39)	118 (38.1)
More than 4000 RMB	59 (23.7)	70 (22.6)
Long-term residence		

Country	117 (47)	150 (48.4)
Cities and towns	132 (53)	160 (51.6)
Primary caregiver		
Spouse	146 (58.6)	181 (58.4)
Sons and daughters	58 (23.3)	70 (22.6)
Parents	21 (8.4)	26 (8.4)
Oneself	15 (6)	20 (6.5)
Other	9 (3.6)	13 (4.2)
Living situation		
Live by oneself	7 (2.8)	8 (2.6)
Spouse cohabitation	190 (76.3)	237 (76.5)
Two generations live together	19 (7.6)	22 (7.1)
Big family	29 (11.6)	38 (12.3)
Other	4 (1.6)	5 (1.6)
Medical expenses payment manner		
Medical insurance	95 (38.2)	116 (37.4)
Rural cooperative medical care	140 (56.2)	178 (57.4)
Self pay	14 (5.6)	16 (5.2)
Treatment of disease		
Surgery/ Chemotherapy	214 (85.9)	266 (85.8)
Surgery /Chemotherapy/ Radiotherapy	25 (10)	32 (10.3)
Surgery/ Chemotherapy /Radiotherapy	3 (1.2)	3 (1.0)
Endocrinotherapy		
Surgery /Chemotherapy /Radiotherapy	3 (1.2)	4 (1.3)
/Molecular targeting treatment		
Surgery/ Chemotherapy/ Radiotherapy/	1 (0.4)	1 (0.3)
Endocrinotherapy /Molecular targeting		
treatment		
Surgery/Chemotherapy/Endocrinotherapy	1 (0.4)	1 (0.3)
Surgery /Chemotherapy/Molecular targeting	2 (0.8)	3 (1.0)
treatment		
Surgery way		
Breast conserving surgery	68 (27.3)	91 (29.4)
Modified radical operation	25 (10)	28 (9.0)
Mastectomy	156 (62.7)	191 (61.6)
Complications		
No	238 (95.6)	298 (96.1)
Yes	11 (4.4)	12 (3.9)
Family history of disease		
No	245 (98.4)	304 (98.1)
Yes	4 (1.6)	6 (1.9)

### Cross-cultural adaption

During the expert consultation process, a psychologist believed the Chinese



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4 expression of Item 3 ‘We can deal with illness as a family’ was hard to understand. He  
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6 suggested changing it with a substitute word and adjusting the word order. Another  
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8 experts believed that ‘social network’ in item 11 ‘We feel that the people in our social  
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10 network would be happy to support us emotionally in dealing the illness’ was easily  
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12 confused with social platforms on the Internet in Chinese. They suggested changing  
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14 it to ‘social circle’. In addition, expert thought the Chinese expressions of Item 16  
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16 ‘Our friends respect our family for how we reacted to the illness’ and Item 17 ‘We  
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18 believe that we can manage the illness’ had ambiguities. Combined with the feedback  
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20 of the subjects in the pretest, we did appropriate readjustment suitable for Chinese  
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22 cultural background. During the pretesting, almost all patients thought the Chinese  
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24 expressions of Item 1 ‘We understand each other with regard to the experience of  
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26 illness we are living’ was inappropriate and hard to understand. To clarify the  
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28 meaning of this item for the participants, after communicating with the original author,  
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30 we made amendments.  
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#### 40 **Item analysis**

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42 **correlation analysis.** The correlation analysis showed that the correlation coefficient  
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44 between the score of each item and the total score of the questionnaire was  
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46 0.437~0.712 ( $P<0.01$ ), both greater than 0.4. Thus, all items were reserved.  
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50 **Extreme Value Method.** Critical value method was used as the test index to analyze  
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52 the distinction between entries in the Chinese version of the family resilience  
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54 questionnaire. It showed that the differences among all items were statistically  
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56 significant ( $P<0.01$ ).  
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## Reliability

**Internal consistency.** The Cronbach's  $\alpha$  coefficients for the total Chinese version of Family Resilience Questionnaire was 0.909. Cronbach's  $\alpha$  coefficients of four factors were 0.902, 0.932, 0.905, 0.963 respectively.

**Test-retest reliability.** The test-retest reliability for the total Chinese version of Family Resilience Questionnaire was 0.905, which respectively were 0.952, 0.949, 0.968, 0.942.

## Validity

**Content validity.** For the expert panel, the scale-level content validity index (S-CVI) was 0.97, and the item-level content validity index (I-CVI) ranged from 0.83 to 1.00.

**Construct validity.** For exploratory factor analysis, KMO value was 0.907, indicating that the data were suitable for factor analysis, and Bartlett's test of sphericity was 5006.376 ( $P < 0.001$ ), suggesting that extraction of common factors could explain most of the statistical information which questionnaire entries represented<sup>[22]</sup>. Four common factors with eigenvalue  $> 1$  were extracted by principal component analysis, which could explain 72.146% of the total variance. Furthermore, four common factors extracted are consistent with the four subscales of the original English questionnaire. The load of each item on its dimension in the component matrix was  $> 0.40$  (minimum value:0.476; maximum value:0.968) by maximum variance orthogonal rotation. The final four common factors extracted in this study were consistent with the original questionnaire. Factor 1 was named Communication and cohesion, Factor 2 was named Perceived social support, Factor 3 was named

Perceived family coping and factor 4 was named Religiousness and Spirituality. See the component matrix of each factor in Table 2.

**Table 2 Factor loading matrix after rotation in the Chinese version of FaRE Questionnaire**

Factor	Item	principal component			
		Factor 1	Factor 2	Factor3	Factor 4
Communication and cohesion	B7 Everyone in the family is open to listening other's opinions regarding the illness	<b>.841</b>	.173	.183	.046
	B4 We discuss the illness-related problems until we find a shared solution	<b>.834</b>	.139	.106	.070
	B6 We are honest when talking about the illness amongst ourselves	<b>.807</b>	.178	.136	.038
	B5 Everyone in the family feels free to express their own opinion regarding the illness	<b>.787</b>	.132	.118	.096
	B2 In our family we feel that we can talk about how to communicate between us	<b>.775</b>	.036	.212	.056
	B3 We can deal this illness as a family	<b>.732</b>	.165	.115	.055
	B8 The things we do for each other in dealing with this illness make us feel part of the family	<b>.688</b>	.120	.175	.011
	B1 We understand each other with regard to the experience of illness we are living	<b>.476</b>	.245	.116	-.009
Perceived social support	B15 We receive gifts and favours from our closest friends	.076	<b>.824</b>	.125	.044
	B12 We feels that our closest friends would be happy to support us emotionally in managing the illness	.249	<b>.804</b>	.185	.077
	B14 We know we are important for our friends	.182	<b>.801</b>	.254	.040
	B10 We can rely on our close friends to help us deal this illness	.035	<b>.797</b>	.047	-.001
	B9 We ask our closest friends to help and assist us in this battle against the illness	.185	<b>.790</b>	.120	.110
	B13 We know that if we need comfort, our closest friends will be there for us	.189	<b>.788</b>	.258	.095
	B11 We feel that the people in our social network would be happy to support us emotionally in dealing the illness	.173	<b>.788</b>	.170	.052
Perceived social support	B16 Our friends respect our family for how we reacted to the illness	.241	<b>.780</b>	.222	.076
	B17 We believe that we can manage the illness	.259	.266	<b>.818</b>	-.004
	B18 We can solve important problems in our life such as this illness	.216	.313	<b>.815</b>	.032
	B19 We feel we are strong enough to cope with this illness	.300	.204	<b>.804</b>	.044
	B20 We have the strength to solve our problem	.231	.271	<b>.780</b>	.084
Religiousness and Spirituality	B24 We ask our religious/spiritual reference figure for advice or words of comfort about the illness	.059	.055	.019	<b>.968</b>
	B21 We attend the church / synagogue / mosque/other places	.074	.101	.034	<b>.938</b>

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3	of worship				
4	B23 We participate in the activities of our religious	.041	.060	.032	<b>.935</b>
5	community				
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7	B22 We believe there is a supreme spiritual being that will	.081	.098	.053	<b>.933</b>
8	help us deal this illness				
9					
10	Eigenvalues	3.423	9.149	1.638	3.105
11	Cumulative variance tribute rate (%)	38.120	52.383	65.320	72.146
12					

To further verify the structural validity of the questionnaire, 310 samples were subjected to confirmatory factor analysis using AMOS 21.0 software. According to the structure and dimension of the original questionnaire, Communication and cohesion, Perceived social support, Perceived family coping and Religiousness and Spirituality were set as four latent variables. And the factor structure including 24 items was set as observation variable to establish a preset model of confirmatory factor analysis. Normality test for the collected data showed that each item's skewness index was far < 3, kurtosis index of was far < 8. The data were normally distributed. Therefore, the maximum likelihood method was adopted to estimate the parameter model. The initial model fitting results were shown in Figure 1.

The fitting indexes of the initial model were not ideal, which indicated the deviation between the default model and the actual observation data. It needed to be revised. The model was revised on the basis of the original hypothesis model. The modification index of the model was defined as 4. If the modification index was greater than 4, it meant that the model needed to be modified. Fitting indexes both were greater than 0.9 after the modification of the default model, which reached an acceptable range (Figure2). See Table 3 for the fitting indexes before and after the modification.

**Table 3 Fitting indexes before and after the model modification**

Indexes	$\chi^2/df$	RMR	GFI	CFI	IFI	NFI	RMSEA
before modification	2.478	0.09	0.851	0.938	0.938	0.900	0.069
after modification	1.697	0.039	0.912	0.972	0.972	0.934	0.048
reference standards	1~3	<0.05	>0.90	>0.90	>0.90	>0.90	<0.05 very good <0.08 good <0.10 fair

## Discussion

The FaRE Questionnaire is an instrument designed to measure family resilience among patients with cancer<sup>[19]</sup>. The study was conducted to determine whether the FaRE Questionnaire could be used among Chinese patients with breast cancer in mainland China. Through literature review, the Chinese research status of family resilience was not profound enough, especially for patients with breast cancer. Accurately assessing the family resilience of breast cancer patients is the basis. A recent review showed that instruments for family resilience in patients with breast cancer lacked localization<sup>[25]</sup>. Thus we translated the FaRE Questionnaire into Chinese using forward and back-translation, expert review, cultural adaption and pilot testing to ensure the semantic equivalence and intelligibility of the Chinese version of the questionnaire. We also examined the reliability and validity of the Chinese version of the FaRE Questionnaire using item analysis, reliability, content validity, exploratory factor analysis, and confirmatory factor analysis.

Previously, the original Italian version of the questionnaire was proved to be reliable and valid among a total of 213 patients with histologically confirmed

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4 non-metastatic breast or prostate cancer. Nevertheless, patients' lifestyles and cultural  
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6 backgrounds in China are different from Italy. Our study suggested that the FaRE  
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8 Questionnaire can be adapted to Chinese cultures, which had excellent content  
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10 validity and construct validity as well as high internal consistency reliability and  
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12 test-retest reliability among patients with breast cancer.  
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16 Item analysis showed that correlation coefficients between the score of each  
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18 item and the total score of the questionnaire were both greater than 0.4, and the CR  
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20 value also was statistically significant, indicating suitability or reliability of items.  
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24 Cronbach's  $\alpha$  coefficient for the total FaRE Questionnaire was 0.909 for the  
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26 including sample, and Cronbach's  $\alpha$  coefficients of four factors were respectively 0.90,  
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28 0.932, 0.905, 0.963, indicating high internal consistency reliability of the Chinese  
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30 version of FaRE Questionnaire. This finding was higher than Cronbach's  $\alpha$  for the  
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32 Italian population<sup>[18]</sup>. The Chinese version of the FaRE Questionnaire also had a high  
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34 test-retest reliability, indicating good time stability in breast cancer patients.  
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40 Results of our study shown that the FaRE Questionnaire had a good content  
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42 validity, indicating that the questionnaire can accurately reflect the family resilience  
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44 of patients with breast cancer. Exploratory factor analysis and confirmatory factor  
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46 analysis were conducted on the large-scale samples to examine the construct validity.  
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48 For exploratory factor analysis, the analyses results indicated that all the items had  
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50 factor loading  $>0.476$ , meeting the criterion for significance. For confirmatory factor  
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52 analysis, the results indicated a four-factor structure consistent with the original Italy  
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54 version. These indicated that the validity of the Chinese version of the FaRE  
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4 Questionnaire was relatively stable and was consistent with the tabulation theory.  
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7 As a global public health problem threatening women' health, breast cancer has more  
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9 significant impacts on patients, their spouses, family members, conjugal relationships  
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11 and family function. Family resilience emphasizes how the family as a system can  
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13 cope with stress and adversity to help the family achieve good adjustment and  
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15 adaptation. It is imperative to pay attention to the family resilience of breast cancer  
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17 patients. The Chinese version of the FaRE questionnaire finally formed in this study  
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19 has been subjected to strict reliability and validity test. The preliminary results also  
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21 show that the questionnaire can scientifically and effectively evaluate the family  
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23 resilience of breast cancer patients in mainland China. The Chinese version of FaRE  
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25 questionnaire has satisfactory validity and reliability for use among patients with  
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27 breast cancer in mainland China. Further research can use the instrument to assess the  
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29 family resilience of breast cancer patients, and on this basis provide personalized and  
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31 scientific family resilience intervention. However, there are some limitations in the  
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33 study. Data should have been collected from family members as well, given the  
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35 questionnaire is not just aimed at patients. Content validity scores should have been  
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37 gathered for patients and family members as part of the expert panel. In addition, it  
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39 would have been beneficial to provide some evidence of construct validity, and future  
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41 studies are suggested to examine the convergent validity and evaluate of sensitivity of  
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43 4 factors.  
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## 53 54 55 **Conclusions**

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58 The results of this study suggest that the Chinese version of FaRE Questionnaire is a  
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4 valid and reliable instrument. It can effectively assess the family resilience and  
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6 provide an instrument for future research.  
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24 MML, RM and SFZ contributed to the conception, design and manuscript writing of the study,  
25  
26 revising the draft critically for important intellectual content. SSW, JWJ and LML contributed to  
27  
28 the questionnaire translation, data acquisition and interpretation of the outcomes. PPW and ZZZ  
29  
30 contributed to study supervision, project administration and funding acquisition. PW contributed  
31  
32 to the crucial revision of the manuscript for important intellectual content, provided final  
33  
34 confirmation of the revised version to be published.  
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4 **Competing interests** None declared.  
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6 **Patient consent for publication** Parental/guardian consent obtained.  
7

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9 **Ethics approval**

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11 The Ethics Committee of Zhengzhou University has approved the study(ZZURIB 2020-19).  
12

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17 **Data availability statement** Data are available on reasonable request.  
18

19 Contact:17839945811@163.com.  
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34  
35 **Declaration of conflicting interests**

36  
37 We have read and understood BMJ policy on declaration of interests and declare that we have no  
38  
39 competing interests.  
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## Figure legends

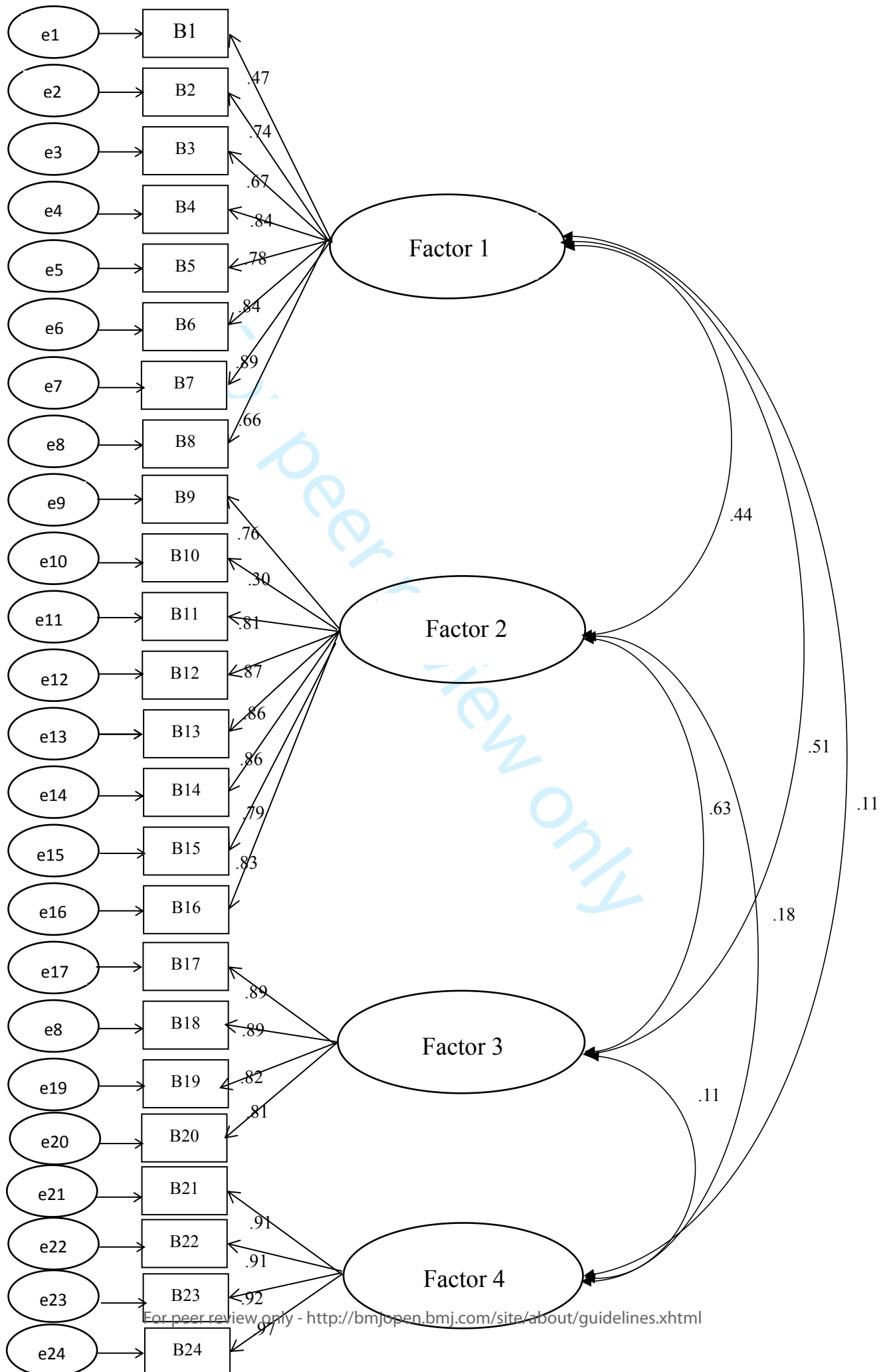
**Figure 1 Fitting figure of default model of Chinese version of FaRE Questionnaire**

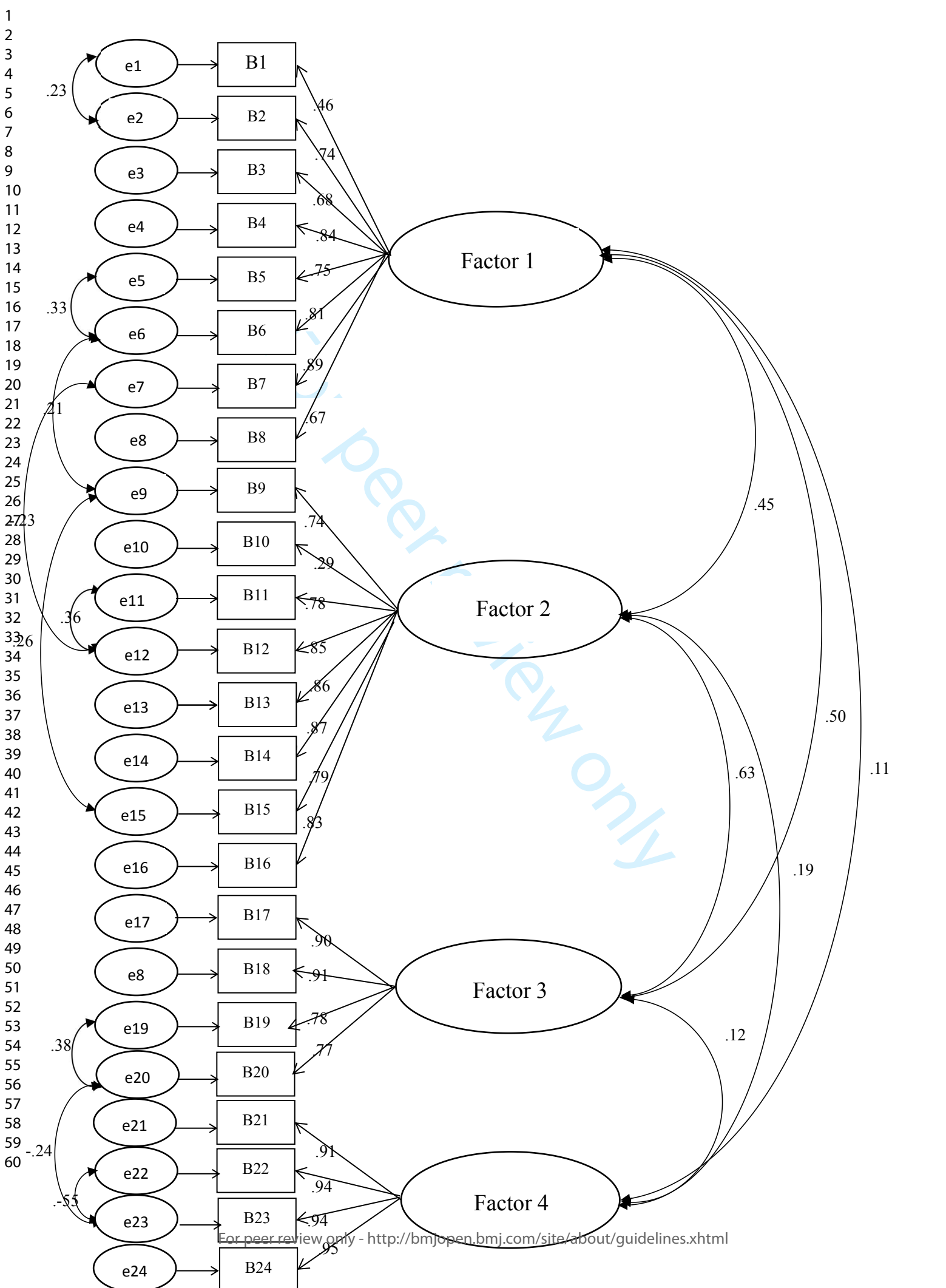
**Figure 2 Fitting figure of modification model of the Chinese version of FaRE Questionnaire**

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## STROBE Statement—checklist of items that should be included in reports of observational studies

	Item No	Recommendation
<b>Title and abstract</b>	1	(a) Indicate the study's design with a commonly used term in the title or the abstract <i>yes✓ page 2 in clean copy</i> (b) Provide in the abstract an informative and balanced summary of what was done and what was found <i>yes✓ page 2-3 in clean copy</i>
<b>Introduction</b>		
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported <i>yes✓ page 3-5 in clean copy</i>
Objectives	3	State specific objectives, including any prespecified hypotheses <i>yes✓ page 5 in clean copy</i>
<b>Methods</b>		
Study design	4	Present key elements of study design early in the paper <i>yes✓ page 5 in clean copy</i>
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection <i>yes✓ page 5-6 in clean copy, page 8(data collection ) in clean copy</i>
Participants	6	(a) <i>Cohort study</i> —Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up <i>Case-control study</i> —Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls <i>Cross-sectional study</i> —Give the eligibility criteria, and the sources and methods of selection of participants <i>yes✓ page 5-6 in clean copy</i> (b) <i>Cohort study</i> —For matched studies, give matching criteria and number of exposed and unexposed <i>Case-control study</i> —For matched studies, give matching criteria and the number of controls per case
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable <i>yes✓ page 9-11 in clean copy</i>
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group <i>yes✓ page 6-7 in clean copy</i>
Bias	9	Describe any efforts to address potential sources of bias
Study size	10	Explain how the study size was arrived at <i>yes✓ page 6 in clean copy</i>
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why <i>yes✓</i>
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding <i>yes✓ page 9-11 in clean copy</i> (b) Describe any methods used to examine subgroups and interactions (c) Explain how missing data were addressed (d) <i>Cohort study</i> —If applicable, explain how loss to follow-up was addressed <i>Case-control study</i> —If applicable, explain how matching of cases and controls was addressed <i>Cross-sectional study</i> —If applicable, describe analytical methods taking account of sampling strategy <i>yes✓ page 6 in clean copy</i> (e) Describe any sensitivity analyses

Continued on next page



<b>Results</b>		
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed <b>yes✓ page 6 in clean copy</b> (b) Give reasons for non-participation at each stage (c) Consider use of a flow diagram
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders <b>yes✓ page 11-12 in clean copy</b> (b) Indicate number of participants with missing data for each variable of interest (c) <i>Cohort study</i> —Summarise follow-up time (eg, average and total amount)
Outcome data	15*	<i>Cohort study</i> —Report numbers of outcome events or summary measures over time <i>Case-control study</i> —Report numbers in each exposure category, or summary measures of exposure <i>Cross-sectional study</i> —Report numbers of outcome events or summary measures <b>yes✓ page 9-11 in clean copy</b>
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included <b>yes✓ page 11-16 in clean copy</b> (b) Report category boundaries when continuous variables were categorized (c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses
<b>Discussion</b>		
Key results	18	Summarise key results with reference to study objective <b>yes✓ page 17-19 in clean copy</b>
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias <b>yes✓ page 19 in clean copy</b>
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence <b>yes✓ page 19 in clean copy</b>
Generalisability	21	Discuss the generalisability (external validity) of the study results
<b>Other information</b>		
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based <b>yes✓ page 20 in clean copy</b>

\*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

**Note:** An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at [www.strobe-statement.org](http://www.strobe-statement.org).

# BMJ Open

## Reliability and validity of the Chinese version of the Family Resilience Questionnaire (FaRE Questionnaire) in patients with breast cancer: a cross-sectional study

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<b>Primary Subject Heading</b>:	Nursing
Secondary Subject Heading:	Nursing, Health services research, Oncology
Keywords:	ONCOLOGY, PSYCHIATRY, Health policy < HEALTH SERVICES ADMINISTRATION & MANAGEMENT

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## Title page

**Title:** Reliability and validity of the Chinese version of the Family Resilience Questionnaire (FaRE Questionnaire) in patients with breast cancer: a cross-sectional study

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16 **Keywords:** breast cancer; family resilience; nursing; healthcare  
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18  
19 **Word count:** 5969  
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21 **Reliability and validity of the Chinese version of the Family Resilience**  
22 **Questionnaire (FaRE Questionnaire) in patients with breast cancer: a**  
23 **cross-sectional study**  
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28  
29 **ABSTRACT**  
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32 **Objective** The aim of this study was to assess the reliability and validity of the Chinese version of  
33  
34 the Family Resilience Questionnaire among patients with breast cancer in China.  
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37 **Design** It was a cross-sectional study, which involved translation, back-translation, cultural  
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39 adjustment, and psychometric testing of a 24-item family resilience questionnaire.  
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42 **Setting** Three tertiary hospitals in Zhengzhou, China. Respectively are the First Affiliated  
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44 Hospital of Zhengzhou University, Second Hospital Affiliated to Zhengzhou University,  
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46 Henan provincial people's hospital.  
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49 **Participants** A total of 559 patients with breast cancer volunteered to participate in the study  
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52 **Primary outcome measures** Data analysis was performed using the IBM SPSS software  
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54 version 21.0 and AMOS software version 21.0. Cronbach's  $\alpha$  coefficient was used to  
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56 examine the internal consistency. The test-retest reliability was calculated using the intraclass  
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3 correlation coefficient on 30 participants. The content validity index was calculated based on the  
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6 values obtained from six expert opinions. Construct validity test was performed using factor  
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9 analysis including exploratory factor analysis and confirmatory factor analysis.

10  
11 **Results** For the Chinese version of FaRE questionnaire, the Cronbach's  $\alpha$  coefficient of the total  
12  
13 questionnaire was 0.909, and Cronbach's  $\alpha$  coefficients of four factors were 0.902, 0.932, 0.905,  
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15 0.963 respectively. The test-retest reliability index of the total questionnaire was 0.905. The  
16  
17 Scale-Content Validity Index (S-CVI) was 0.97, and Item-Content Validity Index (I-CVI) ranged  
18  
19 from 0.83 to 1.00. The questionnaire included 24 items, exploratory factor analysis extracted four  
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21 factors with loading  $> 0.4$ , which could explain 72.146% of the total variance. Confirmatory factor  
22  
23 analysis showed the Chinese version of FaRE questionnaire had an excellent four-factor model  
24  
25 consistent with the original questionnaire.  
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32 **Conclusion** The Chinese version of FaRE Questionnaire has acceptable reliability and validity  
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34 among patients with breast cancer in China. It can effectively assess family resilience and provide  
35  
36 basis for personalized family resilience interventions for patients with breast cancer.  
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#### 40 **Strengths and limitations of this study**

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42 **►** This is the first study to describe the translation and cultural and of the FaRE  
43  
44 Questionnaire, and to explore its psychometric relevance in patients for breast cancer  
45  
46 in China.  
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49 **►** The study had sufficient sample size with precise statistics methods.  
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52 **►** The findings of our study were only based on data from patients from three  
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54 hospitals in Zhengzhou, which may not be representative of patients with breast  
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56 cancer in mainland China.  
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4 ▶ Convergent validity assessment and evaluation of sensitivity of 4 factors will be  
5  
6 considered in future research.  
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## 8 9 **Introduction**

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11 Breast cancer had the highest incidence in new cancer cases, whose morbidity  
12  
13 and mortality was respectively 24.2%, 15.0% in women and topped the list  
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15 according to the latest global cancer statistics in 2018<sup>[1]</sup>. Breast cancer ranks fifth  
16  
17 among malignant tumors in China, and breast cancer ranks first among malignant  
18  
19 tumors in women. Although the development of medical technology makes the  
20  
21 survival time of patients with breast cancer significantly prolong<sup>[2]</sup>, diagnosis of  
22  
23 breast cancer, mastectomy and long-term postoperative chemoradiotherapy also  
24  
25 inevitably lead to severe adverse stress reactions. Meanwhile, breast cancer is not just  
26  
27 a personal event. It is also a more critical family event<sup>[3]</sup>. According to  
28  
29 Bowen family systems theory<sup>[4]</sup>, cancer diagnosis and related clinical treatment of a  
30  
31 family member may cause patients and their families to be in a state of adverse and  
32  
33 high stress, and ultimately affect the stability and balance of the whole family  
34  
35 system<sup>[5]</sup>. Previous studies on family stress of patients with breast cancer mainly  
36  
37 focused on two aspects, which were both negative. On the one hand, the studies  
38  
39 mainly paid attention to negative emotions of patients with breast cancer such as  
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41 anxiety, pessimism, fear<sup>[6-7]</sup> and depression<sup>[8]</sup> and descending quality of life<sup>[9]</sup> and  
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43 their family members' psychological distress<sup>[10]</sup>, physical burden<sup>[11]</sup>, psychosocial  
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45 burden and economic burden<sup>[12]</sup>. On the other hand, the studies focused on a variety  
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47 of adverse family stress reactions including family dysfunction<sup>[13-14]</sup> and reduced  
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3 family life quality of patients with breast cancer<sup>[15]</sup>.  
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6 With the proposing of family systems theory and the rising of positive  
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8 psychology, while discussing the negative impact of cancer on the whole family,  
9  
10 domestic and foreign scholars also found that families of cancer patients have positive  
11  
12 resilience<sup>[16]</sup>. Positive psychology is a new science that studies traditional psychology  
13  
14 from a positive perspective. It adopts scientific principles and methods to study  
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16 happiness, advocates the positive orientation of psychology, studies the positive  
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18 psychological quality of human beings, pays attention to the health, happiness and  
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20 harmonious development of human beings. Current Researches showed that the focus  
21  
22 of research on family stress of cancer patients has gradually shifted to the strength and  
23  
24 power of family, namely, family resilience. It has been widely used in psychology and  
25  
26 nursing<sup>[17]</sup>. Family resilience is defined as an attribute that helps families face changes,  
27  
28 overcome adversity and adapt to the risk. Strong family resilience can not only  
29  
30 improve the physical and mental health of patients and their family members but also  
31  
32 maintain healthy family functions. It ultimately promote a virtuous cycle of family  
33  
34 functions<sup>[18]</sup>. At the same time, compared with other types of cancer, breast cancer has  
35  
36 more significant impacts on patients, their spouses, family members, conjugal  
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38 relationships and family function<sup>[18]</sup>. Thus, for breast cancer patients, family resilience  
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40 may provide a new theoretical basis for interventions to maintain healthy family  
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42 functions. Therefore it is vital to assess the family resilience of patients with breast  
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44 cancer accurately.  
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58 However, domestic research on family resilience of patients with breast cancer in  
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3 China is less. Now there is still a lack of effective family resilience assessment tools.  
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6 Family Resilience Questionnaire was compiled based on Walsh Family Resilience  
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8 Model by Italian scholar Faccio et al<sup>[19]</sup>. It includes 24 items and four dimensions:  
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10 communication and cohesion, perceived social support, perceived family coping,  
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12 religiousness and spirituality. The FaRE Questionnaire is used to measure family  
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14 resilience, more specifically, the family dynamics and resources and estimating the  
15  
16 adaptation flexibility to cancer disease. The questionnaire has been tested in patients  
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18 with breast cancer in Italy and has good reliability and validity<sup>[19]</sup>. Therefore, the  
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20 purpose of this study was to provide a validated tool for assessing family resilience in  
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22 Chinese breast cancer patients through translation and psychometric testing of FaRE  
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24 questionnaire.  
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## 31 **Methods**

### 32 **Study Design**

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35 The study is a cross-sectional study. The study was approved by the Ethics  
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37 Committee of Zhengzhou University (ZZURIB 2020-19). All patients volunteered to  
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39 participate  
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42 in the study and provided informed written consent. In the study, patients with breast  
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44 cancer were recruited from three hospitals in Zhengzhou from December 2019 to  
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46 February 2020 and From August 2020 to September 2020. The inclusion criteria of  
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48 breast cancer were as follows: (1) histopathological examination confirms breast  
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50 cancer; (2) aged 18 years or older; (3) able to read and write Chinese; (4) informed  
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52 consent and voluntary participation in the study. The exclusion criteria were as  
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3 follows: (1) sufferers with mental disorders and communication difficulties; (2) no  
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6 history of other serious life-threatening diseases.  
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9 Data were collected in two sampling sessions. The first sampling was used for  
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11 item analysis, exploratory factor analysis, and internal consistency. The sample size  
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13 should be at least 5 to 10 times that of the questionnaire items<sup>[20]</sup>, our Questionnaire  
14  
15 contains 24 items. The study's sample size was calculated as 8 times of the items, and  
16  
17 the sample loss rate of 15% was taken into account. Therefore, the required sample  
18  
19 size was 221 cases. Actually, two hundred and forty-nine valid questionnaires were  
20  
21 collected in this section finally. In addition, clinical data from a subgroup of 30  
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23 patients from different age groups were collected again for two week after the initial  
24  
25 collection to assess the test-retest reliability of the FaRE questionnaire. The second  
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27 sampling was used for confirmatory factor analysis. It is generally believed that the  
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29 sample size required for confirmatory factor analysis should not be less than 300  
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31 cases<sup>[20]</sup>, 310 cases of valid questionnaires were collected finally.  
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#### 40 **Measurements**

41  
42 Demographic characteristics and clinical data about family resilience were collected  
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44 using the General Information Questionnaire, the Chinese version of the Family  
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46 Resilience Questionnaire.  
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50 **General Information Questionnaire.** The sociodemographic characteristics of the  
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52 participants were collected by General Information Questionnaire. The questionnaire  
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54 include some questions on age, religious faith, marital status, education, occupation,  
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56 Household per capita monthly income, Long-term residence, primary caregiver,  
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3 living situation, payment manner of the medical expenses, treatment of disease,  
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6 surgery way, complication, family history of the disease.  
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8 **The Chinese version of the Family Resilience Questionnaire.** The questionnaire  
9  
10 was developed by Faccio in 2019 according to the Walsh Family Resilience Model  
11  
12 based on breast cancer and prostate cancer patients<sup>[19]</sup>. It comprises 24 items, and four  
13  
14 dimensions: communication and cohesion(8 items), perceived social support(8 items),  
15  
16 perceived family coping(4 items), religiousness and spirituality(4 items). The  
17  
18 Cronbach's  $\alpha$  coefficients of four dimensions were 0.88, 0.88, 0.82 and 0.86  
19  
20 respectively in the original questionnaire, and it had good reliability and validity.  
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22 Questionnaire respondents indicate to what extent they agree with the items on a  
23  
24 seven-point scale method from 'strongly disagree' (scored 1) to 'strongly  
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26 agree'(scored 7). Adding score of each item in the FaRE Questionnaire together to get  
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28 total scores. Higher scores of the FaRE questionnaire reflect higher family resilience  
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30 levels.  
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### 40 **Translation process**

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42 The original author Professor Faccio of FaRE questionnaire authorized the use of it.  
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44 Firstly, we translated the items of FaRE questionnaire into Chinese expressions and  
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46 adapted it cross-culturally using the Brislin translation pattern<sup>[20]</sup>. The translation  
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48 process was as follows<sup>[21]</sup>: (1) Forward translation: two translators, including a  
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50 bilingual graduate student and a bilingual Ph.D. student, independently translated the  
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52 English FaRE questionnaire into two different Chinese versions; (2) Proofreading:  
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54 Research group compared two different Chinese versions and made modifications and  
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3 adjustments to form a harmonized version; (3) Back translation: two graduate students  
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5 majored in English who didn't see the original English version of the questionnaire  
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7 independently translated FaRE questionnaire from Chinese into English. On the  
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9 premise of being faithful to the original questionnaire, researchers carried out forward  
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11 translation and back translation again by comparing the translated English  
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13 questionnaire with the original one to make consistent. (4) Cross-cultural adaptation:  
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15 Expert panel including two psychologists, two clinical medicine specialists, two  
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17 clinical nursing specialists independently reviewed the original, proofread and  
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19 translated version of the questionnaire to give their opinions on cultural equivalency  
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21 and the appropriateness of language translation. Moreover, they were asked to rate  
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23 each item on a four-point Likert type scale ranging from 1 (uncorrelated) to 4  
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25 (strongly correlated) so as to evaluate the content validity of the questionnaire. The  
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27 researchers will choose the most appropriate way of Chinese expression according to  
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29 the suggestions. (5) Pretest: 30 breast cancer patients were interviewed in-depth about  
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31 their understanding of the items, and the items with vague semantics and difficult to  
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33 understand were timely modified. (6) Combined with the results of expert  
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35 consultation and pretest, and form a final Chinese version of the Family Resilience  
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37 Questionnaire.  
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### 50 **Data collection**

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52 During the survey, researchers who received standardized training explained to  
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54 patients the purpose of the study and how to fill out the questionnaire in a uniform  
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56 training language. The General Information Questionnaire and the Chinese version of  
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3 the Family Resilience Questionnaire were administered to each breast cancer patient.  
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6 All patients were able to complete the questionnaires by themselves. Each survey took  
7  
8 about 15-20 minutes to complete.  
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### 10 11 **Patient and public involvement statement** 12

13 Patients or the public were not involved in the design, or conduct, or reporting, or dissemination  
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15 plans of this research. The patients were involved in the study by completing the  
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17 questionnaires face-to-face.  
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### 20 21 **Statistical analysis** 22

23 IBM SPSS software version 21.0 and AMOS software version 21.0 were employed  
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25 for the statistical analyses. Descriptive statistics were used to summarize the breast  
26  
27 cancer patients' sociodemographic characteristics. Item analysis, validity and  
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29 reliability of the questionnaire were assessed. All analyses used two-tailed p values  
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31 and  $p < 0.05$  is considered statistically significant.  
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### 36 37 **Item analysis** 38

39 Item analysis means to test the quality of each item, whose purpose is to test the  
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41 suitability or reliability of instruments and individual items. The results can be used as  
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43 the basis for the screening or modification of individual items. In this study, the  
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45 critical value method and item-total score correlation method were used for item  
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47 analysis. The items with correlation coefficient less than 0.4 or not reaching the  
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49 significant level were deleted<sup>[22]</sup>.  
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### 54 55 **Reliability analysis** 56

57 Internal consistency refers to the homogeneity among items and internal correlation  
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3 among tools, which are assessed using the Cronbach'  $\alpha$  coefficient. Cronbach's  $\alpha$   
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6 coefficient served as a metric for assessing the reliability of the scale. Score greater  
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8 than or equal to 0.7 is considered acceptable<sup>[23]</sup>. More scores indicates more excellent  
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10 internal consistency.  
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14 Test-retest reliability indicates the temporal stability of the questionnaire by  
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16 calculating the Pearson correlation coefficient of the total score and each factor' score.  
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18 Score ranged from 0.70 to 0.89 is considered strong, and score higher than 0.90 is  
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20 considered very strong.  
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### 23 24 **Validity analysis**

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26 The Content Validity Index is calculated based on the values obtained from expert  
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28 opinions. It includes item-level content validity index (I-CVI) and the scale-level  
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30 content validity index (S-CVI) . Six experts rated the correlation between each item  
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32 and its dimension of the Chinese family resilience questionnaire, 1 = not related, 2 =  
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34 weak correlation, 3 = more relevant, 4 = very relevant. I-CVI means that each item  
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36 appropriately reflect the extent of the concept to be measured, and S-CVI indicates  
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38 the mean value of I-CVI of all items. I-CVI  $\geq$  0.78 and S-CVI  $\geq$  0.90 are considered  
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40 acceptable<sup>[23]</sup>.  
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48 The exploratory factor analysis and confirmatory factor analysis were used to  
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50 assess construct validity<sup>[24]</sup>. Kaise-Meyer-Olkin (KMO) test and Bartlett's  $\chi^2$  test were  
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52 used to examine the suitability for factor analysis. For the explanatory factor analysis,  
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54 a load of more than 0.4 of the item on a factor was used as a factor attribution  
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56 criterion. Load less than 0.4 or double load was used as the criteria for deleting the  
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item would be deleted<sup>[22]</sup>. Confirmatory factor analysis was used to examine the Questionnaire four-factor model. Chi-square degree of freedom ratio, Root Mean Square Residual, Goodness of fit index, Comparative fit index, Incremental fit index as well as Root Mean Square Error Approximate was used to evaluate the model<sup>[22]</sup>.

## Results

### Demographic and clinical characteristics

All the breast cancer patients were female. The patients' age of the first sampling was 20~78 (45.77±10.09) years old, and the second sampling was 22~73 (45.7±10.213) years old. The demographic and clinical characteristics of the sample were shown in Table 1.

**Table 1 Characteristics of the participants from two sampling**

Category	First sampling (n=249)	Second sampling (n=310)
Marital status		
Single	10 (4)	15 (4.8)
Married	232 (93.2)	286 (92.3)
Education		
Divorced or widowed	7 (2.8)	9 (2.9)
Bachelor or above	31 (12.4)	37 (11.9)
Diploma	31 (12.4)	36 (11.6)
High school, technical secondary	48 (19.3)	59 (19.0)
Occupation		
Middle school	139 (55.8)	178 (57.4)
On job	59 (23.7)	70 (22.6)
Sick rest	23 (9.2)	28 (9.0)
Retirement	34 (13.7)	39 (12.6)
Unemployed or otherwise	133 (53.4)	173 (55.8)
Household per capita monthly income		
Less than 2000 RMB	93 (37.3)	119 (38.4)
2000-3999 RMB	97 (39)	118 (38.1)
More than 4000 RMB	59 (23.7)	70 (22.6)
Long-term residence		
Country	117 (47)	150 (48.4)
Cities and towns	132 (53)	160 (51.6)

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3	Primary caregiver		
4	Spouse	146 (58.6)	181 (58.4)
5	Sons and daughters	58 (23.3)	70 (22.6)
6	Parents	21 (8.4)	26 (8.4)
7	Oneself	15 (6)	20 (6.5)
8	Other	9 (3.6)	13 (4.2)
9			
10	Living situation		
11	Live by oneself	7 (2.8)	8 (2.6)
12	Spouse cohabitation	190 (76.3)	237 (76.5)
13	Two generations live together	19 (7.6)	22 (7.1)
14	Big family	29 (11.6)	38 (12.3)
15	Other	4 (1.6)	5 (1.6)
16			
17	Medical expenses payment manner		
18	Medical insurance	95 (38.2)	116 (37.4)
19	Rural cooperative medical care	140 (56.2)	178 (57.4)
20	Self pay	14 (5.6)	16 (5.2)
21			
22	Treatment of disease		
23	Surgery/ Chemotherapy	214 (85.9)	266 (85.8)
24	Surgery /Chemotherapy/ Radiotherapy	25 (10)	32 (10.3)
25	Surgery/ Chemotherapy /Radiotherapy	3 (1.2)	3 (1.0)
26			
27	Endocrinotherapy		
28	Surgery /Chemotherapy /Radiotherapy	3 (1.2)	4 (1.3)
29			
30	/Molecular targeting treatment		
31	Surgery/ Chemotherapy/ Radiotherapy/	1 (0.4)	1 (0.3)
32			
33	Endocrinotherapy /Molecular targeting		
34	treatment		
35	Surgery/Chemotherapy/Endocrinotherapy	1 (0.4)	1 (0.3)
36	Surgery /Chemotherapy/Molecular targeting	2 (0.8)	3 (1.0)
37			
38	treatment		
39	Surgery way		
40	Breast conserving surgery	68 (27.3)	91 (29.4)
41	Modified radical operation	25 (10)	28 (9.0)
42	Mastectomy	156 (62.7)	191 (61.6)
43			
44	Complications		
45	No	238 (95.6)	298 (96.1)
46	Yes	11 (4.4)	12 (3.9)
47			
48	Family history of disease		
49	No	245 (98.4)	304 (98.1)
50	Yes	4 (1.6)	6 (1.9)
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### Cross-cultural adaption

During the expert consultation process, a psychologist believed the Chinese expression of Item 3 'We can deal with illness as a family' was hard to understand. He



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3 suggested changing it with a substitute word and adjusting the word order. Another  
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6 experts believed that ‘social network’ in item 11 ‘We feel that the people in our social  
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9 network would be happy to support us emotionally in dealing the illness’ was easily  
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11 confused with social platforms on the Internet in Chinese. They suggested changing  
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13 it to ‘social circle’. In addition, expert thought the Chinese expressions of Item 16  
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16 ‘Our friends respect our family for how we reacted to the illness’ and Item 17 ‘We  
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19 believe that we can manage the illness’ had ambiguities. Combined with the feedback  
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22 of the subjects in the pretest, we did appropriate readjustment suitable for Chinese  
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25 cultural background. During the pretesting, almost all patients thought the Chinese  
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28 expressions of Item 1 ‘We understand each other with regard to the experience of  
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31 illness we are living’ was inappropriate and hard to understand. To clarify the  
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34 meaning of this item for the participants, after communicating with the original author,  
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36 we made amendments.

### 37 **Item analysis**

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40 **correlation analysis.** The correlation analysis showed that the correlation coefficient  
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43 between the score of each item and the total score of the questionnaire was  
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46 0.437~0.712 ( $P<0.01$ ), both greater than 0.4. Thus, all items were reserved.

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48 **Extreme Value Method.** Critical value method was used as the test index to analyze  
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51 the distinction between entries in the Chinese version of the family resilience  
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54 questionnaire. It showed that the differences among all items were statistically  
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57 significant ( $P<0.01$ ).

### 58 **Reliability**

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4 **Internal consistency.** The Cronbach's  $\alpha$  coefficients for the total Chinese version of  
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6 Family Resilience Questionnaire was 0.909. Cronbach's  $\alpha$  coefficients of four factors  
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8 were 0.902, 0.932, 0.905, 0.963 respectively.  
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10  
11 **Test-retest reliability.** The test-retest reliability for the total Chinese version of  
12  
13 Family Resilience Questionnaire was 0.905, which respectively were 0.952, 0.949,  
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15 0.968, 0.942.  
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## 18 19 **Validity**

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21 **Content validity.** For the expert panel, the scale-level content validity index (S-CVI )  
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23 was 0.97, and the item-level content validity index (I-CVI) ranged from 0.83 to 1.00.  
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27 **Construct validity.** For exploratory factor analysis, KMO value was 0.907,  
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29 indicating that the data were suitable for factor analysis, and Bartlett's test of  
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31 sphericity was 5006.376 ( $P < 0.001$ ), suggesting that extraction of common factors  
32  
33 could explain most of the statistical information which questionnaire entries  
34  
35 represented<sup>[22]</sup>. Four common factors with eigenvalue  $> 1$  were extracted by principal  
36  
37 component analysis, which could explain 72.146% of the total variance. Furthermore,  
38  
39 four common factors extracted are consistent with the four subscales of the original  
40  
41 English questionnaire. The load of each item on its dimension in the component  
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43 matrix was  $> 0.40$  (minimum value:0.476; maximum value:0.968) by maximum  
44  
45 variance orthogonal rotation. The final four common factors extracted in this study  
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47 were consistent with the original questionnaire. Factor 1 was named Communication  
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49 and cohesion, Factor 2 was named Perceived social support, Factor 3 was named  
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51 Perceived family coping and factor 4 was named Religiousness and Spirituality. See  
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the component matrix of each factor in Table 2.

**Table 2 Factor loading matrix after rotation in the Chinese version of FaRE Questionnaire**

Factor	Item	principal component			
		Factor 1	Factor 2	Factor3	Factor 4
Communication and cohesion	B7 Everyone in the family is open to listening other's opinions regarding the illness	<b>.841</b>	.173	.183	.046
	B4 We discuss the illness-related problems until we find a shared solution	<b>.834</b>	.139	.106	.070
	B6 We are honest when talking about the illness amongst ourselves	<b>.807</b>	.178	.136	.038
	B5 Everyone in the family feels free to express their own opinion regarding the illness	<b>.787</b>	.132	.118	.096
	B2 In our family we feel that we can talk about how to communicate between us	<b>.775</b>	.036	.212	.056
	B3 We can deal this illness as a family	<b>.732</b>	.165	.115	.055
	B8 The things we do for each other in dealing with this illness make us feel part of the family	<b>.688</b>	.120	.175	.011
	B1 We understand each other with regard to the experience of illness we are living	<b>.476</b>	.245	.116	-.009
Perceived social support	B15 We receive gifts and favours from our closest friends	.076	<b>.824</b>	.125	.044
	B12 We feels that our closest friends would be happy to support us emotionally in managing the illness	.249	<b>.804</b>	.185	.077
	B14 We know we are important for our friends	.182	<b>.801</b>	.254	.040
	B10 We can rely on our close friends to help us deal this illness	.035	<b>.797</b>	.047	-.001
	B9 We ask our closest friends to help and assist us in this battle against the illness	.185	<b>.790</b>	.120	.110
	B13 We know that if we need comfort, our closest friends will be there for us	.189	<b>.788</b>	.258	.095
	B11 We feel that the people in our social network would be happy to support us emotionally in dealing the illness	.173	<b>.788</b>	.170	.052
Perceived social support	B16 Our friends respect our family for how we reacted to the illness	.241	<b>.780</b>	.222	.076
	B17 We believe that we can manage the illness	.259	.266	<b>.818</b>	-.004
	B18 We can solve important problems in our life such as this illness	.216	.313	<b>.815</b>	.032
	B19 We feel we are strong enough to cope with this illness	.300	.204	<b>.804</b>	.044
	B20 We have the strength to solve our problem	.231	.271	<b>.780</b>	.084
Religiousness and Spirituality	B24 We ask our religious/spiritual reference figure for advice or words of comfort about the illness	.059	.055	.019	<b>.968</b>
	B21 We attend the church / synagogue / mosque/other places of worship	.074	.101	.034	<b>.938</b>
	B23 We participate in the activities of our religious	.041	.060	.032	<b>.935</b>

community				
B22 We believe there is a supreme spiritual being that will help us deal this illness	.081	.098	.053	<b>.933</b>
Eigenvalues	3.423	9.149	1.638	3.105
Cumulative variance tribute rate (%)	38.120	52.383	65.320	72.146

To further verify the structural validity of the questionnaire, 310 samples were subjected to confirmatory factor analysis using AMOS 21.0 software. According to the structure and dimension of the original questionnaire, Communication and cohesion, Perceived social support, Perceived family coping and Religiousness and Spirituality were set as four latent variables. And the factor structure including 24 items was set as observation variable to establish a preset model of confirmatory factor analysis. Normality test for the collected data showed that each item's skewness index was far < 3, kurtosis index of was far < 8. The data were normally distributed. Therefore, the maximum likelihood method was adopted to estimate the parameter model. The initial model fitting results were shown in Figure 1.

The fitting indexes of the initial model were not ideal, which indicated the deviation between the default model and the actual observation data. It needed to be revised. The model was revised on the basis of the original hypothesis model. The modification index of the model was defined as 4. If the modification index was greater than 4, it meant that the model needed to be modified. Fitting indexes both were greater than 0.9 after the modification of the default model, which reached an acceptable range (Figure2). See Table 3 for the fitting indexes before and after the modification.

**Table 3 Fitting indexes before and after the model modification**

Indexes	$\chi^2/df$	RMR	GFI	CFI	IFI	NFI	RMSEA
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before modification	2.478	0.09	0.851	0.938	0.938	0.900	0.069
after modification	1.697	0.039	0.912	0.972	0.972	0.934	0.048
reference standards	1~3	<0.05	>0.90	>0.90	>0.90	>0.90	<0.05 very good <0.08 good <0.10 fair

## Discussion

The FaRE Questionnaire is an instrument designed to measure family resilience among patients with cancer<sup>[19]</sup>. The study was conducted to determine whether the FaRE Questionnaire could be used among Chinese patients with breast cancer in mainland China. Through literature review, the Chinese research status of family resilience was not profound enough, especially for patients with breast cancer. Accurate assessment of family resilience in breast cancer patients is fundamental. A recent review showed that instruments for family resilience in patients with breast cancer lacked localization<sup>[25]</sup>. Thus we translated the FaRE Questionnaire into Chinese through forward and reverse translation, expert review, cultural adaption and pilot testing to ensure the semantic equivalence and intelligibility of the Chinese version of the questionnaire. We also examined the reliability and validity of the Chinese version of the FaRE Questionnaire using item analysis, reliability, content validity, exploratory factor analysis, and confirmatory factor analysis.

Previously, the original Italian version of the questionnaire was proved to be reliable and valid among a total of 213 patients with histologically confirmed non-metastatic breast or prostate cancer. Nevertheless, patients' lifestyles and cultural backgrounds in China are different from Italy. Our study suggested that the FaRE

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Questionnaire can be adapted to Chinese culture, which had excellent content validity and construct validity as well as high internal consistency reliability and test-retest reliability among patients with breast cancer.

Item analysis showed that correlation coefficients between the score of each item and the total score of the questionnaire were both greater than 0.4, and the CR value also was statistically significant, indicating suitability or reliability of items.

Cronbach's  $\alpha$  coefficient for the total FaRE Questionnaire was 0.909, and Cronbach's  $\alpha$  coefficients of four factors were respectively 0.90, 0.932, 0.905, 0.963, indicating high internal consistency reliability of the Chinese version of FaRE Questionnaire. This finding was higher than Cronbach's  $\alpha$  for the Italian population<sup>[18]</sup>. The Chinese version of the FaRE Questionnaire also had a high test-retest reliability, indicating good time stability in breast cancer patients.

Results of our study shown that the FaRE Questionnaire had a good content validity, indicating that the questionnaire can accurately reflect the family resilience of patients with breast cancer. Exploratory factor analysis and confirmatory factor analysis were conducted on the large-scale samples to examine the construct validity. For exploratory factor analysis, the analyses results indicated that all the items had factor loading  $>0.476$ , meeting the criterion for significance. For confirmatory factor analysis, the results indicated a four-factor structure consistent with the original Italy version. These indicated that the validity of the Chinese version of the FaRE Questionnaire was relatively stable and was consistent with the tabulation theory.

As a global public health problem threatening women' health, breast cancer had

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3 more significant impacts on patients, their spouses, family members, conjugal  
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6 relationships and family function. Family resilience emphasizes how the family as a  
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9 system can cope with stress and adversity to help the family achieve good adjustment  
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11 and adaptation. It is imperative to pay attention to the family resilience of breast  
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13 cancer patients. The Chinese version of the FaRE questionnaire finally formed in this  
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16 study has been subjected to strict reliability and validity test. The preliminary results  
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19 also show that the questionnaire can scientifically and effectively evaluate the family  
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22 resilience of breast cancer patients in mainland China. The Chinese version of FaRE  
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25 questionnaire has satisfactory validity and reliability for use among patients with  
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28 breast cancer in mainland China. Further research can use the instrument to assess the  
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31 family resilience of breast cancer patients, and on this basis provide personalized and  
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34 scientific family resilience intervention. However, there are some limitations in the  
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37 study. Data should have been collected from family members as well, given the  
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40 questionnaire is not just aimed at patients. Content validity scores should have been  
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43 gathered for patients and family members as part of the expert panel. In addition, it  
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46 would have been beneficial to provide some evidence of construct validity, and future  
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49 studies are suggested to evaluate the convergent validity and sensitivity of 4 factors.

## 50 **Conclusions**

51  
52 The results of this study indicate that the Chinese version of FaRE Questionnaire is a  
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55 valid and reliable instrument. It can effectively assess the family resilience and  
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58 provide a tool for future research.

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MML, RM and SFZ contributed to the conception, design and manuscript writing of the study, revising the draft critically for important intellectual content. SSW, JWJ and LML contributed to the questionnaire translation, data acquisition and interpretation of the outcomes. PPW and ZXZ contributed to study supervision, project administration and funding acquisition. PW contributed to the crucial revision of the manuscript for important intellectual content, provided final confirmation of the revised version to be published. XYL contributed to improve the quality of English throughout the manuscript.

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3 science planning project of Henan grant number 2021BSH017.  
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6 **Competing interests** None declared.  
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8 **Patient consent for publication** Parental/guardian consent obtained.  
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11 **Ethics approval**  
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14 The Ethics Committee of Zhengzhou University has approved the study(ZZURIB 2020-19).  
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16 **Provenance and peer review** Not commissioned; externally peer reviewed.  
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19 **Data availability statement** No additional data available  
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21 Contact:17839945811@163.com.  
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37 **Declaration of conflicting interests**  
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40 We have read and understood BMJ policy on declaration of interests and declare that we have no  
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42 competing interests.  
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### 55 **General Information Questionnaire.**

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3 Education  
4 Divorced or widowed  
5 Bachelor or above  
6 Diploma  
7 High school, technical secondary  
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9 Occupation  
10 Middle school  
11 On job  
12 Sick rest  
13 Retirement  
14 Unemployed or otherwise  
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16 Household per capita monthly income  
17 Less than 2000 RMB  
18 2000-3999 RMB  
19 More than 4000 RMB  
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21 Long-term residence  
22 Country  
23 Cities and towns  
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25 Primary caregiver  
26 Spouse  
27 Sons and daughters  
28 Parents  
29 Oneself  
30 Other  
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32 Living situation  
33 Live by oneself  
34 Spouse cohabitation  
35 Two generations live together  
36 Big family  
37 Other  
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39 Medical expenses payment manner  
40 Medical insurance  
41 Rural cooperative medical care  
42 Self pay  
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44 Treatment of disease  
45 Surgery  
46 Chemotherapy  
47 Endocrinotherapy  
48 Molecular targeting treatment  
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52 Breast conserving surgery  
53 Modified radical operation  
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5 Family history of disease  
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## 13 **Figure legends**

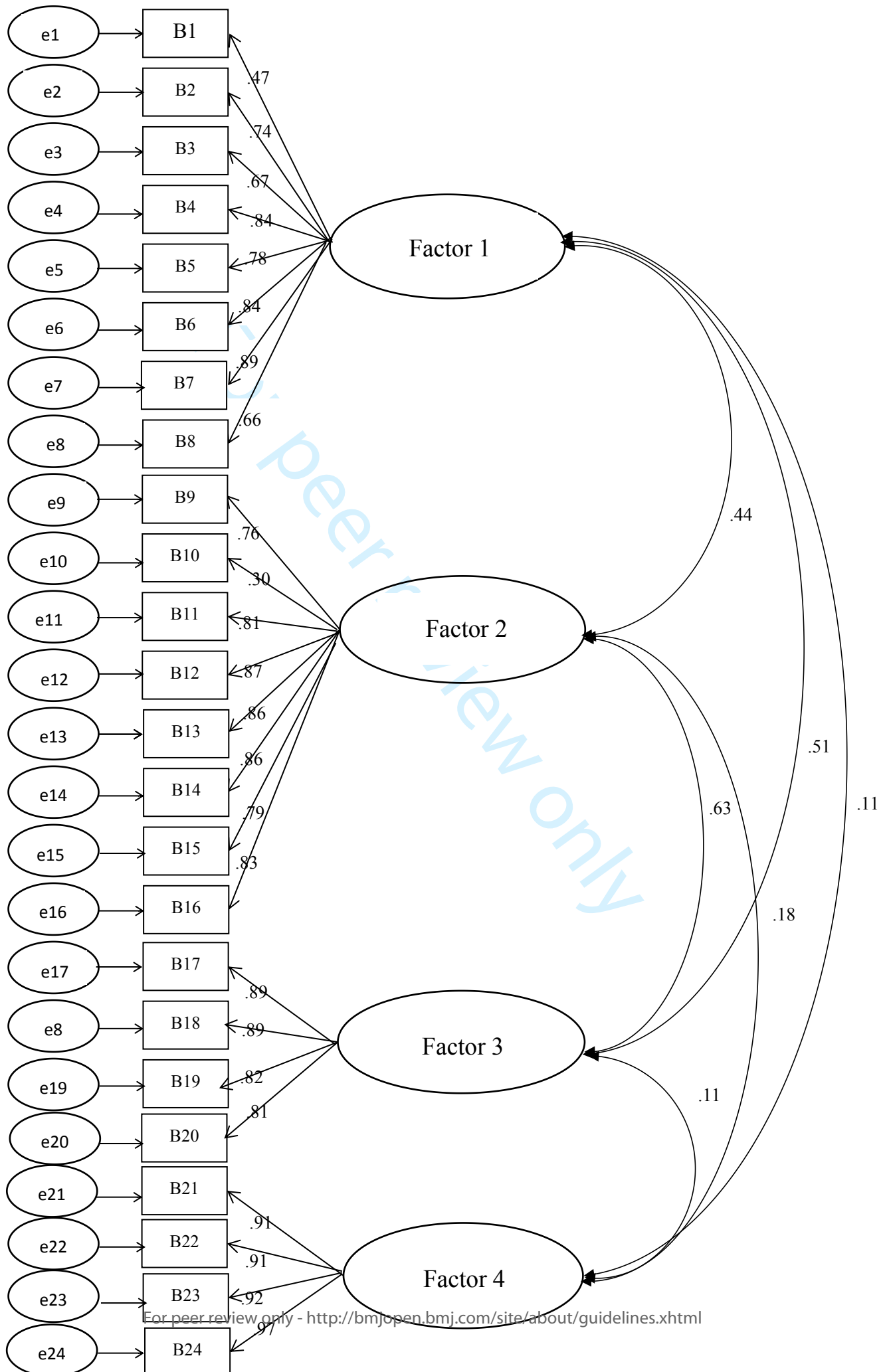
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15 **Figure 1 Fitting figure of default model of Chinese version of FaRE Questionnaire**  
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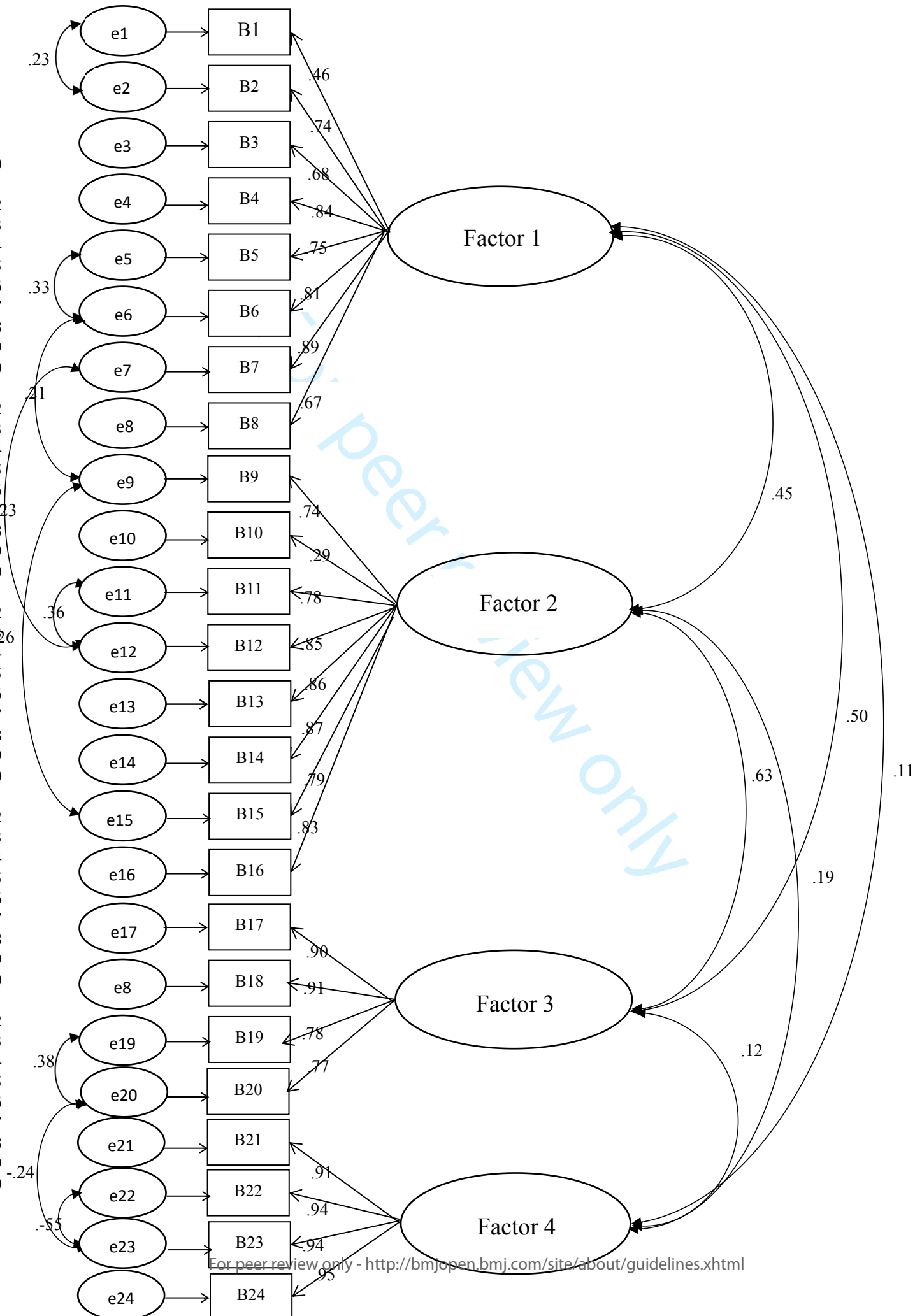
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## STROBE Statement—checklist of items that should be included in reports of observational studies

	Item No	Recommendation
<b>Title and abstract</b>	1	(a) Indicate the study's design with a commonly used term in the title or the abstract <i>yes</i> ✓ <i>page 2 in clean copy</i> (b) Provide in the abstract an informative and balanced summary of what was done and what was found <i>yes</i> ✓ <i>page 2-3 in clean copy</i>
<b>Introduction</b>		
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported <i>yes</i> ✓ <i>page 3-5 in clean copy</i>
Objectives	3	State specific objectives, including any prespecified hypotheses <i>yes</i> ✓ <i>page 5 in clean copy</i>
<b>Methods</b>		
Study design	4	Present key elements of study design early in the paper <i>yes</i> ✓ <i>page 5 in clean copy</i>
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection <i>yes</i> ✓ <i>page 5-6 in clean copy, page 9 (data collection) in clean copy</i>
Participants	6	(a) <i>Cohort study</i> —Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up <i>Case-control study</i> —Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls <i>Cross-sectional study</i> —Give the eligibility criteria, and the sources and methods of selection of participants <i>yes</i> ✓ <i>page 6 in clean copy</i> (b) <i>Cohort study</i> —For matched studies, give matching criteria and number of exposed and unexposed <i>Case-control study</i> —For matched studies, give matching criteria and the number of controls per case <i>Not Applicable</i> ✓
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable <i>yes</i> ✓ <i>page 9-11 in clean copy</i>
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group <i>yes</i> ✓ <i>page 6-7 in clean copy</i>
Bias	9	Describe any efforts to address potential sources of bias <i>Not Applicable</i> ✓
Study size	10	Explain how the study size was arrived at <i>yes</i> ✓ <i>page 6 in clean copy</i>
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why <i>Not Applicable</i> ✓
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding <i>yes</i> ✓ <i>page 9-11 in clean copy</i> (b) Describe any methods used to examine subgroups and interactions <i>Not Applicable</i> ✓ (c) Explain how missing data were addressed <i>Not Applicable</i> ✓ (d) <i>Cohort study</i> —If applicable, explain how loss to follow-up was addressed <i>Case-control study</i> —If applicable, explain how matching of cases and controls was addressed <i>Cross-sectional study</i> —If applicable, describe analytical methods taking account of sampling strategy <i>yes</i> ✓ <i>page 6 in clean copy</i> (e) Describe any sensitivity analyses <i>Not Applicable</i> ✓

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<b>Results</b>		
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed <b>yes</b> ✓ <b>page 6 in clean copy</b> (b) Give reasons for non-participation at each stage <b>Not Applicable</b> ✓ (c) Consider use of a flow diagram <b>Not Applicable</b> ✓
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders <b>yes</b> ✓ <b>page 11-13 in clean copy</b> (b) Indicate number of participants with missing data for each variable of interest <b>Not Applicable</b> ✓ (c) <i>Cohort study</i> —Summarise follow-up time (eg, average and total amount) <b>Not Applicable</b> ✓
Outcome data	15*	<i>Cohort study</i> —Report numbers of outcome events or summary measures over time <b>Not Applicable</b> ✓ <i>Case-control study</i> —Report numbers in each exposure category, or summary measures of exposure <b>Not Applicable</b> ✓ <i>Cross-sectional study</i> —Report numbers of outcome events or summary measures <b>yes</b> ✓ <b>page 11-17 in clean copy</b>
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included <b>yes</b> ✓ <b>page 11-16 in clean copy</b> (b) Report category boundaries when continuous variables were categorized <b>Not Applicable</b> ✓ (c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period <b>Not Applicable</b> ✓
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses <b>Not Applicable</b> ✓
<b>Discussion</b>		
Key results	18	Summarise key results with reference to study objective <b>yes</b> ✓ <b>page 17-20 in clean copy</b>
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias <b>yes</b> ✓ <b>page 19 in clean copy</b>
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence <b>yes</b> ✓ <b>page 19 in clean copy</b>
Generalisability	21	Discuss the generalisability (external validity) of the study results <b>yes</b> ✓ <b>page 19 in clean copy</b>
<b>Other information</b>		
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based <b>yes</b> ✓ <b>page 20-21 in clean copy</b>

\*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

**Note:** An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at [www.strobe-statement.org](http://www.strobe-statement.org).