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# Factor analyses of the Chinese Zarit Burden Interview among caregivers of patients with schizophrenia in a rural Chinese community

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## ABSTRACT

**Objective** This study aimed to evaluate the factor structure of the Chinese version of the 22-item Zarit Burden Interview (ZBI) among family caregivers of patients with schizophrenia in China.

**Methods** Using one-stage cluster-sampling design, 324 primary caregivers of patients with schizophrenia in Ningxiang County, Hunan Province, China, completed the Zarit Burden Interview face-to-face. Confirmatory factor analysis (CFA) was first performed based on existing models to check model fit. Owing to an unsatisfactory result of CFA, exploratory factor analysis (EFA) was then conducted to explore a new factor structure, and a subsequent CFA was run to examine its model fit.

**Results** The CFA results showed that none of the existing models fit the data reasonably well. The EFA results suggested five dimensions: negative emotion (10 items), interpersonal relationship (4 items), time demand (3 items), patient's dependence (2 items) and self-accusation and guilt (2 items). The following CFA confirmed the five-factor solution in this study, and the goodness-of-fit for this model fell within the acceptable range. The overall internal consistency (Cronbach's alpha) was 0.88, and the internal consistency coefficients of individual dimensions were 0.68 to 0.84.

**Conclusion** This study supported a 22-item ZBI scale, with a five-factor structure when applied to Chinese caregivers of patients with schizophrenia.

## INTRODUCTION

The burden on caregivers of patients with schizophrenia is an important and serious problem, having a physical, mental, social and financial impact on patients and caregivers.[1–4] At least 200 different instruments have been developed to assess the burden on caregivers of patients with schizophrenia.[5] The 22-item version of Zarit Burden Interview (ZBI) is one of the most widely used measures of caregiver burden, which assesses the impact of caregiving on caregivers including physical, mental, social and economic aspects. The 22 items are rated on a 5-point Likert-type scale, and item 22 is a global measure assessing

general caregiving burden. Originally developed to assess burden on caregivers of patients with dementia,[6–10] the ZBI has been widely used in measuring caregiver burden related to patients with schizophrenia, which also has demonstrated good reliability and validity.[11–13]

Although the ZBI has been identified by its developer as a non-dimensional scale, some researchers have argued that caregiver burden is multidimensional and that an aggregate score cannot accurately reflect the burden experienced by caregivers. The most commonly reported factor structure of the ZBI consists of personal and role dimensions.[14] There are also other suggested factor structures, including three to five factor models.[15–22]

Based on a review of the literature, we have found various factor structures of the ZBI in different studies, which seemed to be related to the cultural background of the samples and statistical techniques used.[17 19] Considering that factor analysis is sample dependent[23] and that most factor structures suggested for the ZBI were based on studies outside of China, we aimed to conduct a factor analyses of the ZBI based on a sample of Chinese caregivers of patients with schizophrenia in a rural area.

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Toward this end, our plan was to first perform confirmatory factor analysis (CFA) to examine whether existing factor models fit the data of our Chinese sample. If none of the previous models were found to be ideal, we would conduct exploratory factor analysis (EFA) to explore a new factor structure, and then, the new factor structure would be further tested by CFA.

## METHOD

### Sample size calculation

The present study was part of a large project 'study on family burden and experiences of primary caregivers of schizophrenia in community',[24] which had a sample size of 327. After deleting three invalid questionnaires owing to missing values, we had a sample size of 324 for the present study, which met the minimum requirement for factor analysis.[25]

### Participants

The study was conducted in the rural areas of Ningxiang County, Hunan Province, using a one-stage cluster-sampling design. Inclusion criteria for caregiver selection were as follows: (1) caring for patients registered in China's National Continuing Management and Intervention Program for Psychoses, (2) caring for patients diagnosed with schizophrenia based on the Chinese Classification of Mental Disorders, Third Edition or International Classification of Diseases, Tenth Edition, (3) living with the patient, taking most of the responsibility of caring and fully understanding the situation of both the patient and the family and (4) being older than 16 years. Exclusion criteria included the following: (1) caring for patients having comorbidity with other diseases such as epilepsy and (2) being unable to understand the contents of the questionnaire. A total of 352 primary caregivers of patients with schizophrenia were eligible for the study and recruited through China's National Continuing Management and Intervention Program for Psychoses. Among the 352 caregivers, 14 refused to participate and 11 dropped out during interviews. Owing to missing data, 324 valid questionnaires were used for the analysis.

### Procedure

The survey was conducted from November 2015 to January 2016. After signing an informed consent form, each participant was asked to complete a face-to-face interview. All participants received some gifts equivalent to 10 Yuan for their participation. The study was approved by the Human Research Ethic Committee of the Xiangya School of Public Health of Central South University.

### Measures

Social demographic characteristics showed in table 1 were collected by a questionnaire designed for use in this study. The ZBI consists of 22 items, examining caregivers' concern for physical, mental, social and economical aspects of caregiving. Each item is assessed on a 5-point

**Table 1** Characteristics of primary family caregivers (n=324)

| Variables | n (%) or mean (SD) |
| --- | --- |
| Gender, n (%) | |
|   Male | 152 (46.9) |
|   Female | 172 (53.1) |
| Age (years), mean (SD) | 57.8 (12.9) |
| Marriage, n (%) | |
|   Married | 274 (84.6) |
|   Single | 7 (2.2) |
|   Widowed | 41 (12.7) |
|   Divorced or separated | 2 (0.6) |
| Occupation, n (%) | |
|   Full-time employed | 18 (5.6) |
|   Half-time employed | 155 (47.8) |
|   Housewife/house husband | 92 (28.4) |
|   Retired | 26 (8.0) |
|   Unemployed | 33 (10.2) |
| Education, n (%) | |
|   Primary | 183 (56.5) |
|   Middle | 93 (28.7) |
|   High | 48 (14.8) |
| Relation with the patient, n (%) | |
|   Spouse | 147 (45.4) |
|   Parents | 96 (29.6) |
|   Siblings | 28 (8.6) |
|   Children | 22 (6.8) |
|   Other relatives | 31 (9.6) |
| Duration of coresidence (years), mean (SD) | 30.01 (13.55) |
| Duration of coresidence (years), n (%) | |
|   <10 | 29 (9.0) |
|   ≥10 | 292 (90.1) |
| Duration of caregiving (years), mean (SD) | 16.54 (10.92) |
| Duration of caregiving (years), n (%) | |
|   <10 years | 89 (27.5) |
|   ≥10 years | 229 (70.7) |
| Whether having cocaregivers, n (%) | |
|   No | 144 (44.4) |
|   Yes | 180 (55.6) |

Likert scale, ranging from 0='never' to 4='nearly always,' with higher scores indicating greater burden. A total score is calculated by adding the response score for each item, with total scores ranging from 0 to 88. The original ZBI considers a score in the range of 61–88 as severe burden, 41–60 as moderate to severe burden, 21–40 as mild to moderate burden and less than 21 as little or

no burden.[26] The ZBI has been translated into several languages. The Chinese version of the ZBI was translated by Lie Wang.[27] Internal consistency reliability of the different language versions ranges from 0.82 to 0.93.[28–32] Psychometric assessment of the Chinese version has been conducted with samples of caregivers of patients with dementia and caregivers of inpatients, respectively,[21 22] but has not been conducted among caregivers of patients with schizophrenia.

### Statistical analysis

Owing to the ZBI data violating the assumption of multivariate normality, we used the Satorra-Bentler procedure of robust maximum likelihood to correct the statistic (and fit indices based on it) and SE of parameter estimates in the context of CFA. First, we conducted CFA to examine existing models.[14 16 18 19 21 22] As $X^2$ statistic is sensitive to sample size leading to the greater chance of making a type I error, we also reported the Goodness of Fit Index (GFI), Root Mean Square Error of Approximation (RMSEA), Comparative Fit Index (CFI) and Non-Normed Fit Index (NNFI) (TLI). The following cut-off criteria for the goodness of fit indices were used: CFI >0.90, GFI >0.90, NNFI >0.90 and RMSEA <0.060.1[33] As the results of CFA did not support any of the preidentified models, we then conducted EFA to explore the underlying factor structure of the scale after removing item 22, because item 22 is a global measure of caregiving burden and has correlated highly with all other items.[22] The Bartlett's test and the Kaiser-Meyer-Olkin (KMO) index were used to assess suitability of the data for factor analysis, followed by varimax rotation method. Items with factor loadings greater than 0.40 were considered to belong to a specific factor.

Internal consistency reliability was evaluated by calculating Cronbach's alpha, with a recommended level of 0.70 or above considered as satisfactory.

Statistical analysis was conducted using SPSS 18.0 and LISREL 8.7. The statistical significance level of this study was set at 0.05.

### RESULTS

#### Participants' characteristics

As showed in table 1, 172 (53.1%) caregivers were women, and 152 (46.9%) were men. Age of caregivers ranged from 16 to 87 years (57.8±12.9). Most of the primary caregivers were married (84.6%). The majority of respondents had an educational level of elementary school or below (56.5%) and were employed part-time (47.8%). Parents (29.6%) and spouse (45.4%) were the major caregivers. Most of the primary caregivers had been living with the patient for longer than 10 years (90.1%) and caring for the patient for over 10 years (70.7%).

#### Factor analyses

CFA showed that none of the existing models identified in previous literature (see table 2) fit the data reasonably well (see table 3). We then ran EFA to explore the factor structure of the ZBI scale with item 22 removed. KMO index was 0.87, and the Bartlett's Test of Sphericity was 2686.764 (p<0.000), indicating adequate sampling and a suitable correlation matrix for the factor analysis. The EFA results revealed five factors (see table 4). One item (item 17) crossloaded on factor 1 and factor 2, but it conceptually fit with factor 1. The first factor, accounting for 32.24% of the variance, was named negative emotion (items 4, 5, 7, 9, 10, 15, 16, 17, 18 and 19). Factor 2, accounting for 8.35% of the variance, was termed interpersonal relationship (items 6, 11, 12 and 13). Factor 3 (time demand), accounting for 8.10% of the variance, consisted of 3 items (items 1, 2 and 3). Factor 4, accounting for 6.76% of the variance, was regarded as patient's dependence (items 8 and 14). Factor 5 (self-accusation and guilt), accounting for 5.09% of the variance, included two items (items 20 and 21). We conducted CFA on the five-factor model with the 21 items, which showed a moderate fit to the data. Although the $X^2$ statistic and the GFI index indicated that the model did not provide a good fit to the data, other indices fell within the acceptable range ($\chi^2$=381.13, p<0.001, CFI=0.97; GFI=0.89; NNFI=0.96; RMSEA=0.059) (see table 3). The Cronbach's alpha of the final model was 0.88. Internal consistency coefficients of individual subscales ranged from 0.68 to 0.84.

### DISCUSSION

To the best of our knowledge, this is the first factor analyses of the ZBI in a Chinese community sample of caregivers of patients with schizophrenia, using both CFA and EFA. Our results support a five-factor structure: negative emotion (items 4, 5, 7, 9, 10, 15, 16, 17, 18 and 19), interpersonal relationship (items 6, 11, 12 and 13), time demand (items 1, 2 and 3), patient's dependence (items 8 and 14) and self-accusation and guilt (items 20 and 21).

Existing studies have suggested that burden is a multidimensional construct, and a global score cannot provide a complete and accurate assessment.[22] As none of the existing models was found to fit our data well, we have yielded a five-dimension structure through EFA. Although we identified more factors than what has been found in other populations, our factors were similar to those models proposed by Ko et al and Lu et al among Chinese caregivers of patients with dementia and caregivers of inpatients, respectively[21 22] but with different items selected. Differences across these studies may be related to differences in the composition of caregiver samples and techniques used,[17] because providing care for patients with different types of diseases needs different levels of caregiving involvement. In addition, EFA is often considered as a relatively subjective statistical procedure, and different choice of data analysis methods and different criteria used to retain factors may result in different factor models.[34] Further studies are needed to confirm the structure in a Chinese context, in light of the considerable differences in the distribution of items.

**Table 2**  Dimensions of the Zarit Burden Interview Index reported in the literature

| Study | Sample | Method | Factor numbers | Factor name and items |
|---|---|---|---|---|
| Whitlatch et al[14] | 113 dementias | EFA | 2 | Personal strain: 1, 4, 5, 8, 9, 14, 16, 17, 18, 19, 20 and 21 |
| | | | | Role strain: 2, 3, 6, 11, 12 and 13 |
| Hébert et al[32] | 312 dementias | | 2 | Personal strain: 9, 17 and 18 |
| | | | | Role strain: 2, 3, 6, 7, 10, 11, 12, 13 and 22 |
| Bédard et al[40] | 413 dementias | EFA | 2 | Personal strain: 19, 20 and 21 |
| | | | | Role strain: 2, 3, 5, 6, 9, 10, 11, 12 and 17 |
| O'Rourke et al[41] | 1095 and 770 dementias | EFA and CFA | 2 | Role strain: 19, 20 and 21 |
| | | | | Personal strain: 2, 3, 5, 6, 9, 10, 11, 12 and 17 |
| Bachner et al[42] | 148 cognitive impairment | EFA | 2 | Personal strain: 19, 20 and 21 |
| | | | | Role strain: 2, 3, 5, 6, 9, 10, 11, 12 and 17 |
| Bachner et al[43] | 96 cancer | EFA | 2 | Personal strain: 19, 20 and 21 |
| | | | | Role strain: 2, 3, 5, 6, 9, 10, 11, 12 and 17 |
| Knight et al[15] | 220 and 108 dementias | EFA and CFA | 3 | Patient's dependency: 2, 8 and 14 |
| | | | | Self-criticism: 20 and 21 |
| | | | | Embarrassment/anger: 4, 5, 6, 9, 10, 11, 12, 13 and 18 |
| Ankri et al[16] | 152 dementias | EFA | 3 | Psychological burden: 4, 5, 9, 18, 19 and 22 |
| | | | | Impact on caregiving: 1, 6, 11, 12, 13 and 17 |
| | | | | Guilt or self-criticism: 15, 16, 20 and 21 |
| Springate et al[17] | 206 dementias | EFA | 3 | Impact on caregiver's life: 2, 3, 6, 9, 10, 11, 12, 17, 18 and 22 |
| | | | | Guilt: 5, 19, 20 and 21 |
| | | | | Frustration/embarrassment: 1, 4, 13 and 14 |
| Cheng et al[19] | 183 and 212 Alzheimer | EFA and CFA | 4 | Personal strain: 1, 2, 3, 4, 6, 7, 8, 9 and 10 |
| | | | | Captivity: 11, 12, 13 and 14 |
| | | | | Loss of control: 16, 17 and 19 |
| | | | | Self-criticism: 20 and 21 |
| Al-Rawashdeh et al[18] | 124 heart failure | EFA | 4 | Consequences of caregiving: 2, 3, 5, 6, 9, 10, 11, 12, 15 and 17 |
| | | | | Patient's dependence: 1, 8 and 14 |
| | | | | Exhaustion and uncertainty: 4, 13, 16, 18 and 19 |
| | | | | Guilt and fear for patient's future: 7, 20 and 21 |
| Ko et al[21] | 181 dementias | EFA | 5 | Caregiver's oversacrifice: 2, 3, 10, 15, 16, 17, 18 and 22 |
| | | | | Patient's dependence: 8, 11, 12 and 14 |
| | | | | Negative emotion: 4, 5, 6, 9 and 13 |
| | | | | Inadequacy: 20 and 21 |
| | | | | Uncertainty about patient's future: 1, 7 and 19 |
| Lu et al[22] | 523 dementias | EFA and CFA | 5 | Sacrifice: 3, 7, 8, 10, 11, 12, 13 and 14 |
| | | | | Loss of control: 15, 16, 17 and 19 |
| | | | | Embarrassment/anger: 4, 5, 6 and 9 |
| | | | | Self-criticism: 20 and 21 |
| | | | | Dependence: 1, 2 and 18 |

CFA, confirmatory factor analysis; EFA, exploratory factor analysis.

**Table 3** Results of confirmatory factor analyses

| Model description | $\chi^2$ | df | GFI | CFI | NNFI (TLI) | RMSEA |
|---|---|---|---|---|---|---|
| Whitlatch—2 factors, 18 items | 634.39 | 134 | 0.80 | 0.88 | 0.87 | 0.11 |
| Ankri—3 factors, 16 items | 348.43 | 87 | 0.86 | 0.92 | 0.90 | 0.096 |
| Cheng—4 factors, 18 items | 644.92 | 129 | 0.82 | 0.90 | 0.89 | 0.10 |
| Al-Rawashdeh—4 factors, 21 items | 792.90 | 183 | 0.79 | 0.90 | 0.88 | 0.10 |
| Lu—5 factors, 21 items | 693.18 | 179 | 0.81 | 0.92 | 0.90 | 0.094 |
| Ko—5 factors, 22 items | 748.03 | 199 | 0.81 | 0.92 | 0.91 | 0.092 |
| 5 factors, 22 items | 381.13 | 179 | 0.89 | 0.97 | 0.96 | 0.059 |

CFI, Comparative Fit Index; GFI, Goodness of Fit Index; NNFI, Non-Normed Fit Index; RMSEA, Root Mean Square Error of Approximation.

Our largest factor was negative emotion. This dimension incorporates several factors referred to by other researchers as negative emotion,[35] psychological burden[16] and fear for patients' future.[18] On examination of item

**Table 4** Exploratory factor analyses for the 21-item Zarit Burden Interview

| Item | 5 dimension | | | | |
|---|---|---|---|---|---|
| | F1[*] | F2[†] | F3[‡] | F4[§] | F5[¶] |
| 4 | 0.69 | | | | |
| 5 | 0.68 | | | | |
| 7 | 0.61 | | | | |
| 9 | 0.60 | | | | |
| 10 | 0.43 | | | | |
| 15 | 0.61 | | | | |
| 16 | 0.66 | | | | |
| 17 | 0.52 | 0.43 | | | |
| 18 | 0.55 | | | | |
| 19 | 0.66 | | | | |
| 6 | | 0.81 | | | |
| 11 | | 0.61 | | | |
| 12 | | 0.83 | | | |
| 13 | | 0.72 | | | |
| 1 | | | 0.62 | | |
| 2 | | | 0.80 | | |
| 3 | | | 0.70 | | |
| 8 | | | | 0.86 | |
| 14 | | | | 0.83 | |
| 20 | | | | | 0.89 |
| 21 | | | | | 0.89 |
| Eigenvalue | 6.77 | 1.75 | 1.70 | 1.42 | 1.07 |
| Proportion of explained variance (%) | 32.24 | 8.35 | 8.10 | 6.76 | 5.09 |

*F1=Negative emotion.
†F2=Interpersonal relationship.
‡F3=Time demand.
§F4=Patient's dependence.
¶F5=Self-accusation and guilt.

content, we have found that this factor encompasses several complicated feelings of caregivers in caring for the patient, including anger, concern, annoyance, anxiety, frustration and embarrassment; therefore, we named it negative emotion.

Our second largest factor was interpersonal relationship, which is labelled as interpersonal relation,[36] embarrassment/anger[15] or captivity[19] in other studies. In this study, we have named it interpersonal relationship, because all of these items describe the impact of caring for patients with schizophrenia on caregiver's social life.

The third largest factor was time demand comprising three items (items 1, 2 and 3), which belong to specific factors in different studies. In this study, we have termed this factor time demand owing to the fact that caregiving leads to caregivers' time insufficiency or restrictions on caregivers' time, which bears resemblance to the time-dependence burden factor reported by Novak and Guest[37]

The fourth factor was patient's dependence, which is also found in other Asian samples,[21 38] indicating the patient's dependence on the caregiver.

The last factor was self-accusation and guilt comprising only two items (items 20 and 21). Although there were differences in the samples, this factor was also found in the Chinese context[19 21 22] as well as several other cultural contexts and appears to be the most stable or generalisable factor across samples and cultures.[15 39]

Several limitations of this study should be noted. First, we did not evaluate the caregiver's depressive and anxious symptoms for providing evidence of construct validity in the present study. Second, the sample size was relatively small; therefore, it would also strengthen the results if the EFA results we have reported here can be tested by CFA among a different sample of caregivers of patients with schizophrenia. In addition, the findings reflect only one geographical area of Hunan Province in China. As such, generalisation of the findings should be done with caution with regard to caregivers in other regions. Further research is needed to overcome these limitations.

Notwithstanding these limitations, our study of ZBI adds to the understanding of dimensions of caregiver burden in a rural Chinese community. Results from this study support a 22-item ZBI scale, with a five-factor structure when applied to Chinese caregivers of patients with

schizophrenia. In future studies, CFA of the five-factor structure should be conducted with other populations and disorders.

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