Psychometric evaluation of the Chinese version of the Fatigue Scale for Children: abridged secondary publication

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KEY MESSAGES

1. The Chinese version of the Fatigue Scale for Children (FS-C) is a reliable and valid tool in assessing cancer-related fatigue among Hong Kong Chinese children who have survived cancer.
2. The Chinese version of FS-C is crucial for guiding interventions to alleviate fatigue in children who have survived cancer.
3. Confirmatory factor analysis confirmed that there are three factors underlying the Chinese version of FS-C.

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Introduction

Cancer-related fatigue is the most common adverse effect reported by children who have survived cancer.[1] A valid and reliable instrument to measure patients' and survivors' fatigue level is crucial. The Fatigue Scale for Children (FS-C)[2] has not been translated into Chinese or used in Hong Kong children. Concepts or items in the original scale may be inapplicable to Hong Kong children. The FS-C was initially developed to assess the level of cancer-related fatigue in children during cancer treatment and thus may be inappropriate for survivors who have completed treatment. Confirmatory factor analysis was not used to test the hypothesised configuration of the factor structure or measurement model, owing to the small sample size. It is unknown whether the factor structure of the Chinese version of FS-C was congruent with the findings in previous exploratory factor analysis. Evaluation on both linguistic and cultural equivalence is required prior to the use of the Chinese version of FS-C for childhood cancer survivors in Hong Kong.

Methods

This cross-sectional study was approved by the Institutional Review Board of The University of Hong Kong / Hospital Authority Hong Kong West Cluster. Written informed consent was obtained from the parents. Children were asked to put their names on a special assent form and were told that their participation was voluntary. This study was conducted in the outpatient clinic of a public acute-care hospital in Hong Kong. Inclusion criteria were cancer survivors who had completed treatment at least 6 months previously, age of 7 to 12 years, and ability to speak Cantonese and read Chinese. Children with recurrence or second malignancies or those with cognitive or learning problems were excluded.

Subjects were asked to respond to the Chinese version of FS-C, the Center for Epidemiologic Studies Depression Scale for Children, and the Pediatric Quality of Life Inventory.

A panel of experts was asked to rate the semantic equivalence of each item of the Chinese version of the FS-C using a four-point scale (1=not equivalent, 4=most equivalent). Any item with a rating of 1 or 2 by >20% of panel members was amended accordingly. Similarly, the content equivalence of each item was rated using a four-point scale (1=not relevant, 4=very relevant).

For construct validity, the known-group technique was used with a one-way between-group analysis of variance to compare the levels of fatigue among 50 childhood cancer survivors, 50 cancer children receiving treatment, and 50 healthy counterparts.

Convergent validity was assessed using the Pearson correlation coefficient to explore the correlation between scores on the Chinese versions of the FS-C and Center for Epidemiologic Studies Depression Scale for Children. Discriminant validity was determined by examining the correlation between scores of the Chinese version of the FS-C and Pediatric Quality of Life Inventory.

Confirmatory factor analysis was conducted using LISREL (version 8.8 for Windows; Scientific Software International, Lincolnwood [IL], USA) to enable more precise testing of the configuration of the factor structures of the Chinese version of the FS-C and to examine whether the proposed factor

TABLE. Levels of fatigue among cancer survivors, cancer children receiving treatment, and healthy counterparts

	Cancer survivors (n=50)	Cancer children receiving treatment (n=50)	Healthy counterparts (n=50)
Level of fatigue	26.4±9.7	31.1±7.6	23.0±5.6
	Cancer survivors vs cancer children receiving treatment	Cancer survivors vs healthy counterparts	Cancer children receiving treatment vs healthy counterparts
Mean difference	-4.7, P=0.01	3.4, P=0.03	8.1, P<0.00

structures (three-factor model) fitted the data adequately. The generally weighted least-squares method with asymptotic covariance matrixes was used to estimate the parameters. The χ^2 / degrees of freedom ratio, root mean square error of approximation, comparative fit index, and goodness-of-fit index were then calculated to examine the overall fit of the data model with the scale.

Internal consistency was assessed by calculating Cronbach's alpha. 20% of the survivors were randomly selected to be tested again through telephone after 2 weeks. The test-retest reliability was estimated by calculating the intraclass correlation coefficient.

Results

54.5% of the survivors were male. 46.5% had received chemotherapy and 36.5% had received mixed methods. 26.5% had completed treatment for 6 to 12 months. Demographics of the childhood cancer survivors, cancer children receiving treatment, and healthy counterparts were comparable.

The semantic equivalence for items of the Chinese version of FS-C ranged from 83% to 100%, indicating high meaning equivalence to the original version. The content validity index (CVI) of the scale was 0.80, with CVI of each item ranging from 0.17 (item 8) to 1. All items except item 8 were relevant to the concept of fatigue in Hong Kong Chinese children cancer survivors. After removal of item 8, the CVI of the scale increased to 0.85, with CVI of each item ranging from 0.83 to 1.

For construct validity, the mean score of the Chinese version of FS-C in cancer survivors was significantly lower than that in cancer children receiving treatment but significantly higher than that in healthy counterparts (26.4 vs 31.1 vs 23.0, Table). This indicated good known-group validity.

There were a strong positive correlation (r=0.51, P<0.01) between the Chinese version of FS-C and Center for Epidemiologic Studies Depression Scale for Children, and a strong negative correlation (r= -0.52, P<0.01) between the Chinese version of FS-C and Pediatric Quality of Life Inventory.

In the three-factor model (13-item), the factor loadings ranged from 0.38 to 0.95, with positive correlations between parameters. The residuals ranged from 0.14 to 0.37. This reflected that the measurement errors were small. The χ^2 / degrees of freedom ratio was 1.15; root mean square error of approximation was 0.03; comparative fix index was 0.96; and goodness-of-fit index was 0.95. The results demonstrated that the three-factor model adequately fit the data collected using the Chinese version of FS-C.

The intraclass correlation coefficient at 2-week interval was 0.92. The internal consistency (Cronbach's alpha) of the Chinese version of FS-C (14 items) was 0.91. The corrected item-total correlations ranged from 0.13 (item 8) to 0.73. All items except item 8 correlated with the total score of the scale. After removal of item 8, the Cronbach's alpha of the Chinese version of FS-C (13 items) was 0.92.

Discussion

Confucianism emphasises achieving harmony in body and daily lives. Therefore, Hong Kong children are more likely to stay calm when facing adversity like cancers and tend not to show negative emotions including madness to others.[3] The CVI for item 8 was particularly low, indicating irrelevance with the concept of cancer-related fatigue among Hong Kong childhood cancer survivors. Therefore, item 8 was removed from the scale.

The construct validity of the Chinese version of FS-C was good, indicating that it is a valid instrument to identify different groups of children with different levels of fatigue.

Convergent validity and discriminant validity of the Chinese version of FS-C were good. Scores of the Chinese versions of FS-C were strongly and positively correlated with the score of the Center for Epidemiologic Studies Depression Scale for Children. This indicated that children with higher levels of fatigue are more likely to report depression.[4] Scores of the Chinese version of the FS-C have a strong negative correlation with the score of the Pediatric Quality of Life Inventory. This indicates the decrease in quality of life by cancer-related fatigue among childhood cancer survivors.[5]

Confirmatory factor analysis revealed that the good-fit indices supported the three-factor model.

The congruence could be explained by the adverse effects of cancer-related fatigue, which severely deteriorates ability to perform daily activities.[5] The deterioration was so severe that cultural discrepancies between Hong Kong and the West only slightly affect survivors' perceptions and experience of fatigue, resulting in the presentation of similar symptoms.

The Chinese version of FS-C should be used by healthcare professionals and the community to assess and monitor the levels of fatigue in Hong Kong childhood cancer survivors, in combination with other validated scales that assess depressive symptoms and quality of life, so that early screening and interventions can be implemented.

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Disclosure

The results of this research have been previously published in:

1. Ho KY, Li WH, Lam KW, Chiu SY, Chan CF. The psychometric properties of the Chinese version of the fatigue scale for children. Cancer Nurs 2016;39:341-8.

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