



Reliability and Validity of the Chinese Version of the Pittsburgh Fatigability Scale for the Older Adults

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ABSTRACT

The aim of this study was to assess the validity and reliability of the Chinese version of Pittsburgh Fatigability Scale (PFS) for community elderly. A cross-sectional design was conducted in a sample of 775. SPSS20.0 and AMOS22.0 software were used for statistical analysis. In the Development Sample and Validation Sample, confirmatory factor analysis showed all 10 items loaded on two factors: social and physical activities. PFS Mental scores had strong internal consistency, the Cronbach's α of the overall scale was 0.90. Each item was positively correlated with the total score of the scale, and the difference was statistically significant. The Pittsburgh Fatigability Scale (PFS) can be used to evaluate the situation of fatigability among community elderly, and has good reliability and validity.

Keywords: Community older adults; Pittsburgh fatigability scale; Reliability; Validity

INTRODUCTION

Fatigue is an important aspect of aging and health, which is a potential early sign of impending decline in activity among seemingly robust, high-functioning older adults [1]. Fatigue maybe the result of an inactive lifestyle, it can also be a symptom of the result of medical treatments or psychiatric illnesses [2]. Older adults often perceive fatigue without a clear physiological cause, which is suggested to be a consequence of aging in general [3]. Fatigue is a common symptom of burden affecting the well-being of older people, who often experience fatigue without a clear physiological reason. Fatigue in older adults is associated with sustained decline in sexual function and has been suggested as a clinical marker to identify people who at risk for adverse health outcomes such as frailty, disability and hospitalization [4]. The prevalence of fatigability varies widely, ranging from 5% to 68%, depending on the assessment tool or the characteristics of the study population [1,5]. Prevalence rates vary widely from study to study due to the lack of a consistent definition and consensus on assessment tools. The wide variation in prevalence makes it difficult to assess fatigue or understand its role in disabling the older adults [6]. To fill this gap, Glynn developed the Pittsburgh Fatigue Scale in 2015, which used as a tool for adults 60 years or older to measure perceived physical and mental fatigue [1]. PFS was developed specifically to assess physical and mental fatigue in older adults, which consisted of 10 items describing activities

of varying duration and intensity to measure how much fatigue limits a person's body [7]. PFS has recently been confirmed in maneuverability reducing [8]. In this study, the scale of PFS was introduced into China for the first time and tested its reliability and validity, in order to obtain a screening instrument of fatigue among older adults.

MATERIALS AND METHODS

Participants and procedure

A cross-sectional survey was conducted from May to July 2019 in Xiangfang district, Nangang District, Daoli District and Daowai District of Harbin City, Heilongjiang Provinces, China, which were selected from city at random.

Inclusion criteria: (1) Resident population with age 60 years old, (2) having a clear consciousness, can communicate with the investigators normally, and (3) Informed consent to the investigation and willingness to cooperate.

Exclusion criteria: (1) Suffering from acute and critical diseases, such as organ failure, malignant tumors, etc. (2) Psychopaths. Finally, the target number of participants were determined based on the criterion proposed by Kendall in 1975 (i.e. 10-fold the number of items). Given the sampling error of convenience sampling, the sample size was increased by 50%. A sample of 160 older adults' people was required. 775 individuals were investigated in this study.

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Instruments

The Pittsburgh Fatigability Scale (PFS) was developed by Glynn et al. in 2015, is a 10-item questionnaire that asks respondents to rate their level of physical and mental tiredness separately from 0 (no fatigue) to 5 (extreme fatigue) that they expect or imagine they would feel after completing activities of varying intensity and duration 10-items listed in Table 1. PFS Mental scores were also categorized by severity strata: 0-3, 4-7, 8-12, 13-15, 16-19, and 20 points or more. The higher the total score, the more mentally tired people felt.

Translation procedure

Following translation guidelines [9], the English version of PFS was translated into Chinese by 2 professors majoring in English, two other translators did the reverse translation. The researchers compared the translations until they got to the final version. A bilingual team of three nursing professionals examined the original text. At last, 10 students were randomly selected to evaluate the scale. According to their feedback, the Mental Vulnerability Questionnaire was revised and improved. The final Chinese version PFS was shown in Table 1.

Statistical analysis

Data analysis use SPSS 20.0 and AMOS 22.0. The internal consistency of the PFS was estimated by Cronbach's alpha. Reliability was calculated by the test-retest reliability intraclass correlation coefficients. Content validity index and Pearson's correlation coefficients between item and total score were used to evaluate the content validity of the scale. In order to estimate content validity, five experts were invited to evaluate the items

of the PFS. The Exploratory and Confirmatory Factor Analysis (EFA and CFA) were used to examine the construct validity of the PFS, with the data were randomly divided into two samples according to the random number key method, and exploratory factor analysis was conducted on sample 1 (n=379), confirmatory factor analysis was performed on sample 2 (n=396).

RESULTS

Descriptive statistics

Eighteen invalid questionnaires were excluded from the 900 completed questionnaires, and 775 completed responses were ultimately acquired 86.1% effective response rate and included in the data analysis. The age range of these individuals was 60-97 years, and the mean age of the study subjects was 68.00 ± 1.75 years. The age stratification, economic sources, etc., are shown in Table 2.

Reliability

The Cronbach's alpha of the PFS was 0.909, the dimension of physical activities was 0.922, the dimension of social activities was 0.875. The split-half reliability was 0.746, and the test-retest reliability was 0.925. As seen in Table 3. The item-to-total correlations ranged between 0.649 and 0.880 and the overall Cronbach's alpha value of the scale will not be improved by deleting any item. The mean score of PFS was 19.17 ± 7.86 . Item P4 had the highest mean score (2.16 ± 0.97), followed by P7 (2.14 ± 0.80). Item P9 had the lowest mean score of 1.56 ± 0.95 . The results of factor analysis showed that there was a positive correlation between the score of each item and the total score.

Table 1: The appraisal of Pittsburgh fatigability scale (English version and Chinese).

Items (English/Chinese)	Score
Leisurely walk for 30 minutes	0 1 2 3 4 5
Brisk or fast walk for 1 hour	0 1 2 3 4 5
Light household activity for 1 hour	0 1 2 3 4 5
Heavy gardening or yard work for 1 hour	0 1 2 3 4 5
Watching TV for 2 hours	0 1 2 3 4 5
Sitting quietly for 1 hour	0 1 2 3 4 5
Moderate- to high-intensity strength training for 30 minutes	0 1 2 3 4 5
Participating in a social activity for 1 hour	0 1 2 3 4 5
Hosting a social event for 1 hour	0 1 2 3 4 5
High-intensity activity for 30 minutes	0 1 2 3 4 5

Note: 0: No fatigue; 1: Mild fatigue; 2: General fatigue; 3: Moderate fatigue; 4: Severe fatigue; 5: Extreme fatigue.

Table 2: Frequency distribution of demographic characteristics (n=775).

Factors	Group	n	%
District	Xiangfang	221	28.5
	Nangang	204	26.3
	Daoli	172	22.2
	Daowai	178	23
Gender	Male	356	45.9
	Female	419	54.1
Age in year	60-69	439	53.4
	70-79	282	36.4
	80-89	52	6.7
	≥ 90	2	3.5

Education level	Elementary school or less	276	35.6
	Middle school	333	43
	High school	79	10.2
	Professional education	64	8.3
	Undergraduate or more	23	2.9
Marital status	Having spouse	759	97.9
	Divorced	181	23.4
	Widowed	297	38.3
Monthly income	<1500 yuan	246	31.7
	1500~2500 yuan	285	36.8
	>2500 yuan	244	31.5

Table 3: Mean score and reliability analysis of the Chinese version of the Pittsburgh.

Items	M	SD	Item-to-Total	Cronbach's
			Correlation	α if Item
			Coefficient (r)	Deleted
1	1.88	0.84	0.715	0.9
2	1.81	0.99	0.73	0.9
3	1.91	0.98	0.717	0.9
4	2.16	0.98	0.817	0.89
5	1.62	0.92	0.718	0.9
6	1.94	0.98	0.692	0.9
7	2.15	0.99	0.88	0.88
8	2.11	0.96	0.704	0.9
9	1.56	0.97	0.649	0.9
10	2.04	0.92	0.863	0.89

Note: M1-M10=Item1-Item10, and each item is explained in Table 1.

Validity

The results of the EFA indicated that the Kaiser–Meyer–Olkin (KMO) was 0.889, and Bartlett's Test of Sphericity was 5696.621, with significant statistical significance ($P < 0.01$). Content validity index I-CVI of each item level was 0.840~1.000, and the content validity index S-CVI of the scale was 0.824. Two common factors were extracted by principal component analysis and maximum variance rotation, which explained 70.601% of the total variance. Ten of the entries' factor loadings and communalities are displayed in Table 4. The structural equation model and the standardized regression coefficients of three-factor model of PFS appear in Figure 1.

DISCUSSION

Our study findings indicate that the Chinese version of the PFS is a valid, easy to use measurement of perceived physical fatigability in Chinese older adults, which could help us better understand how these factors affect fatigability in a representative sample of the older adults in China. In the present study, the total fatigue score of more than 20 was 385, the extreme fatigue prevalence is 49.7%, which is exceeded to previous cross-sectional researches showing the prevalence of fatigability 43.8% in community-dwelling older adults [10]. According to the 2018 China Statistical Yearbook, China has a population of 240 million over 60 years old, accounting for 17.3% of the total population, making it become the largest number of older adult's people in the world [11]. The aging population phenomena make it become important to paying more attention to the health of older adults.

The results of this study showed that the older adults with

higher levels of fatigue, lower average energy levels, and poorer performance and functioning were found in men, older age, lower education, and lower monthly income, which is consistent with the research results of Eleanor et al. At the same time, this study also showed that there was no statistical significance in the difference of fatigability level in whether there was a spouse or not, which may be caused by the lower average age of the selected older adults samples or other factors. There were 385 people with a fatigue total score of more than 20, which proved that there were a large number of older adults with high fatigue level in China, the fatigue assessment of the older adults is closely related to frailty, so it is worth paying more attention and thinking.

Meanwhile, the 2-factor loading structure concurred with the recently validated PFS-Dutch version [3]. Then, the total Cronbach's α coefficient and the Cronbach's α coefficient of all dimensions of the scale in this study are better than the standard value. It is basically consistent with the Cronbach's α coefficient of 0.85 of the PFS scale in the English version, and it is generally believed that the scale has good cross-cultural characteristics. In addition, the retest reliability is 0.925, higher than 0.78 of the English version. According to the metrics [12], the Chinese version of PFS has good internal consistency and stability.

The CR value of the Chinese version of PFS scale reached the significant level ($P < 0.05$), and the Pearson correlation analysis between each item and the total score was greater than 0.6, indicating a high correlation. All item-to-total correlations were statistically significant. The item-to-total Pearson's correlations ranged from 0.579 to 0.889 ($P < 0.01$), and the item score was positively correlated with the total score. The item-to-total correlation correlations in this study within the recommended

standard range (0.649~0.880), which indicated a good homogeneity [13,14]. In general, the cross-cultural quality of the scale is good.

The Exploratory factor analysis model has two common factors, which are consistent with the English version, and analysis shows that Bartlett spherical test $p < 0.01$ and $KMO > 0.05$, which indicates that the data fit for factor analysis. In the content validity index, $I-CVI > 0.780$, $S-CVI/UA > 0.800$, $S-CVI/AVE > 0.900$, it can be considered as good content validity. After obtaining two common factors through CFA analysis, the cumulative variation of interpretation was 70.601%. In confirmatory factor analysis,

only the chi-square degree of freedom ratio of statistical test does not match the model, which may be caused by the large sample size. Although it does not reach the most appropriate standard, it is within an acceptable range. Other indicators are well adapted, $RMSEA < 0.05$, GFI , $AGFI$, IFI , TLI , $CFI > 0.09$, $PGFI > 0.50$, all within a reasonable range, indicating that the Chinese version of PFS scale has good structural validity in the older adults population. Item analysis was conducted by CR value and correlation coefficient method, and the results showed that CR values reached the significant level of 0.05, indicating that each item of the scale had a good degree of differentiation and could distinguish the response degree of different subjects.

Table 4: Exploratory factor analysis of the Chinese version of the Pittsburgh fatigability scale (n=379).

Items	F1	F2	Communality
1	0.701	-	1
2	0.763	-	2
3	0.866	-	3
4	0.738	-	4
7	0.848	-	7
10	0.897	-	10
5	-	0.805	5
6	-	0.794	6
8	-	0.736	8
9	-	0.759	9

Note: F1: (physical activities, six items); F2: (social activities, four items), solution with three factors (F1 to F2) is shown; "-" means the absolute load of this item ≤ 0.400 .

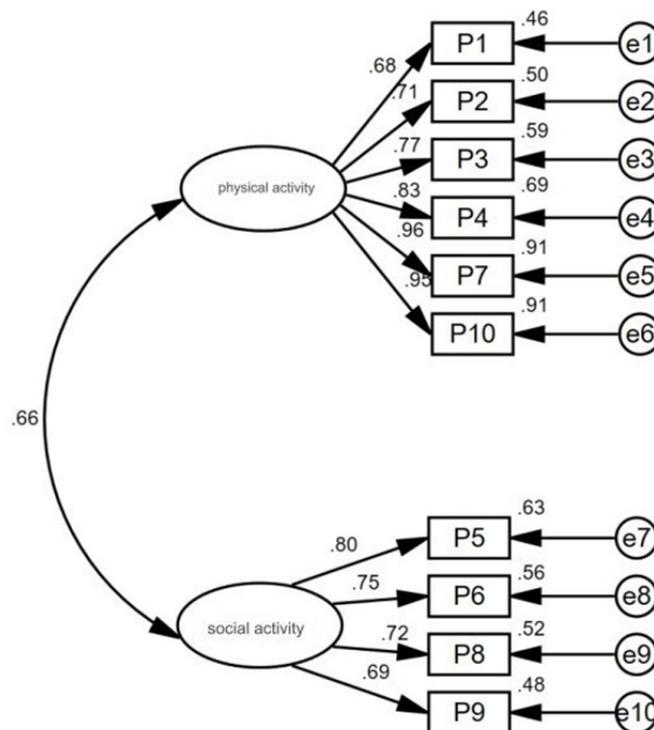


Figure 1: Standardized two-factor structural model of the Chinese version of the Pittsburgh fatigability scale (n=396); F1 (physical activities, six items), F2 (social activities, four items).

CONCLUSION

The study is the first to examine the psychometric properties of a Chinese version of the PFS and to demonstrate the PFS is a convenient and valid tool to assess fatigability among older adults, which has good reliability and validity, can use to self-evaluation or other evaluation. Chinese version of PFS is a useful metric for characterizing and understanding mental fatigability among older adults, which is the only self-report validated instrument to measure perceived physical fatigability. Although there are some differences in the results between the Chinese and English versions, there may have been confusion regarding the interpretation of the intensity of the example activities. There is no denying that perceived fatigability assessment in older adults is becoming increasingly important. Strengthening physical and mental health assessment and community care services for older persons is particularly important.

Implications for psychiatric nursing practice

Previous studies have shown that fatigue is a common symptom in older adults, particularly in those with high comorbidity, the scale can be used as an early assessment before the onset of disease in the Chinese elderly. The assessment of fatigability capacity in the older adults should be highly valued by community nurses and physicians.

LIMITATIONS

This study only conducted a convenient sampling survey on the older adults in the community in Harbin, Heilongjiang Province, and the sample size and scope are limited. In the future, this scale can be further studied in the older adult's patients in other cities, rural areas or hospitals.

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Disclosure

The authors report no conflicts of interest in this work.

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